NOV 19 1928

Telephone Engineer

Far-sighted Telephone Men Say "Adopt Strowger Operation *Now*"

THE successful telephone executive must plan for the future. In order to insure profitable operation for his company he must be able to read the signs of the times, to draw conclusions from the experiences of others and determine his actions accordingly.

If he has been at all observant he will have noticed the marked attention which the larger telephone organizations have, of late, been directing toward their small exchanges; with the result that most of them either have been put on an automatic operating basis, or plans are being prepared for their early conversion.

The reason for this is plain. Small communities everywhere must sooner or later be given telephone service more nearly on a par with that in the cities, and telephone companies are finding that Strowger Automatic is the *one* method which does this *at a profit*. A study of the actual operating records of Strowger Automatic small exchanges in every part of the country, will conclusively demonstrate the high success which results from their adoption both as to service rendered and profits realized from their operation.

Automatic Electric Inc.

Factory and General Offices: 1033 West Van Buren St., Chicago, U. S. A.

Sales and Service Offices in All Principal Cities

EXPORT DISTRIBUTORS

For Australasia—Automatic Telephones, Ltd., Sydney
For Canada—Independent Sales and Engineering Co., Ltd., Vancouver
Elsewhere—The Automatic Electric Company, Ltd., Chicago.

STROWGER AUTOMATIC TELEPHONE EQUIPMENT

Thousands of . . .
"BLACK BEAUTY" POLES
Carried In Stock Ready-To-Ship

WHEN unexpected poles losses or other emergencies occur, and you need poles quickly---remember that the Producers of "Black Beauty" Poles keep on the dry, sand-filled plant storage yards at Orange, Texas, thousands of select creosoted Southern Yellow Pine Poles---in many lengths and sizes, ready to load for immediate shipment, and to be immediately installed when they arrive at destination.

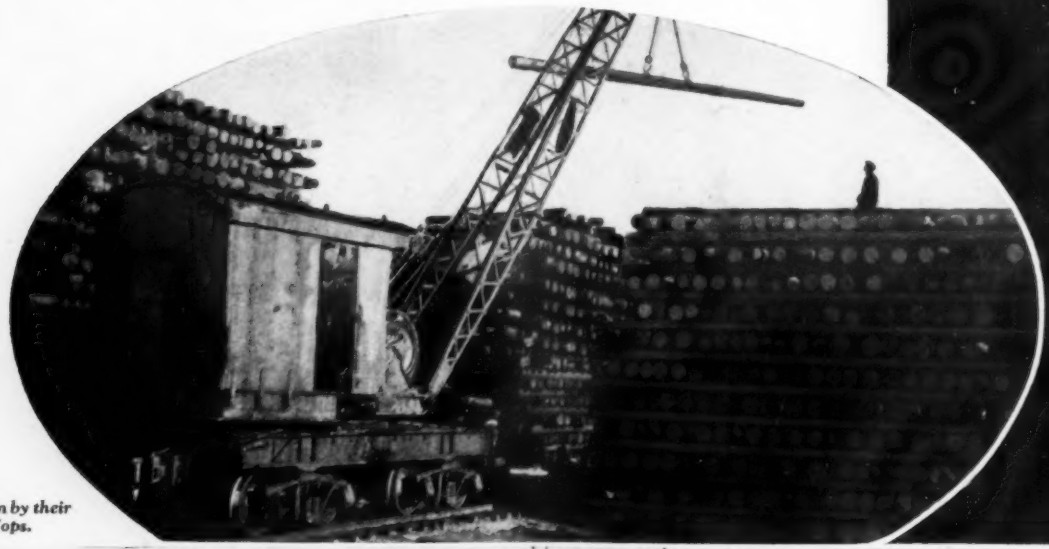
All poles in "Black Beauty" treated stock have been standard roofed, gained, and bored, and scientifically treated with Grade 1 Creosote Oil (A.W.P.A. and A.R.E.A. specifications) by vacuum-pressure method (Rueping Process, 8-lb. final retention).

And if special treatment is desired, a large untreated yard stock and ample plant facilities enable shipment of the average emergency order to be made within 48 hours---often in less time than that.

The "Black Beauty" Plant is one of the few creosoting plants in the country which make it a policy to keep on hand at the plant storage yard a large stock of both treated and untreated poles in the most-used sizes, for quick shipment to customers. This is an important service to pole users. The "Black Beauty" Pole Yards are a ready source of supply. Their use as such has resulted in materially reducing inventory expense for many of our customers.

We would like to serve *you*.

American Electric Company, Inc.
Distributors of "Black Beauty" Poles and Cross Arms to the Independent Telephone Trade.
State and 64th Streets : - : Chicago, Ill.
Branch Office and Warehouse: 622 Wyandotte St., Kansas City, Mo.



Know them by their Red Tops.

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Telephone Engineer

Volume 32 NOVEMBER, 1928 No. 11

A Great Convention

It is nearly a score of years since the writer first began to be an attendant at national conventions of the Independent telephone industry. In all that time, he does not recall any single national meeting that combined excellence of attendance, program and exhibits in the same measure as the national meeting held in Chicago last month.

If there was anything lacking in the attendance, it was that there should have been a greater number of department head and supervisory employees of the various companies. With the work of the association divided into its four divisions and the arrangement for conferences of each division, it is impossible for any company to secure the maximum benefit if it is represented by only one or two people. One manager was heard to remark that he would like to be divided into four parts so that he could attend all of the conferences.

A number of new interests in the telephone field were represented but some that were not, might well have taken advantage of the opportunity to become acquainted with the men in the Independent industry and to learn something of the viewpoint of those who have spent many years in the development of telephone properties. Perhaps better acquaintance between the older men of the industry and those who are coming into it for the first time might be of mutual advantage.

Manufacturers and distributors of telephone equipment and supplies surpassed all previous efforts in displaying their products. All of the display space was taken up and halls were used to accommodate the overflow. Whether or not many orders were written at the convention, there is no doubt that the interest those in attendance showed in the exhibits will result in orders during the year for those exhibitors who follow up their displays with proper advertising and sales effort.

As to the program, a glance over the report of the meeting given in other pages and a reading of some of the papers presented gives ample evidence that the program was one of real value. Nothing was needed to make it more complete and not a single number could have been taken away without making its absence felt. The attendance at the various sessions which at times filled the hall and conference rooms to capacity proved the interest which the programs aroused.

As a general impression, we would say that the convention demonstrated that the Independent telephone industry is in an extremely healthy condition in spite of some uncertainty which has lately arisen from changes in ownership of many companies. By holding a great convention as the one just closed at Chicago, Independent telephony has again shown that it is a truly great industry.

Association Support Needed

A needed clarification of the relation between the national telephone association and the various units of the Independent group was given at the Chicago convention by President F. B. MacKinnon of the United States Independent Telephone Association. Membership in the Independent association rests in telephone companies not in owners of telephone companies. Its membership includes a great majority of the investment and of the stations operated by Independent companies and its policies must be determined by what is to the best interest of all of the companies which make up the Independent group.

Its responsibility is to the group as a whole and to the individual companies that make up the group and not to the ownership of any company or group of companies. Representing the group as a whole, it represents the companies of the group whether or not those companies individually are members of the association. Thus, its agreements with the Bell group in regard to transfer of property are binding upon all Independent companies whether members of the association or not.

Representing the entire group and trying to be of assistance to the companies in the group it has arranged its work into four major divisions, accounting, commercial, plant and traffic. Each

division is subdivided into districts in order that the work may be carried as directly to the companies as possible. Several divisions have already done work that is of real usefulness to the companies of the group if they are sufficiently interested to take advantage of it. Other work is in progress that will be of still greater benefit.

What amounts almost to a mystery in the conduct of the affairs of the association is how it has been able to carry on work of the importance that it has with the limited financial resources at its command. Secretary Deering's report that the total income of the association was approximately $50,000 in 1927 indicates that it is receiving somewhat less than one-tenth of one percent of the gross revenue of Class A, B and C companies, certainly not an exorbitant levy upon Independent company resources.

The fact that outgo is practically equal to income shows that all funds received are needed and the many ways in which the work of the association can be expanded indicates that additional outlay on the part of the companies for work of the association would pay a handsome return. It must not be forgotten that these figures do not take into account services donated to the industry by many men aside from their regular work with their own companies.

We have no hesitation in saying that associated effort has contributed much to the present well-being of companies in the Independent group. With its present policy of interest in the welfare of the companies of the Independent group and with adequate financial support the national association in the future can be of still greater service.

Concerning Depreciation

That hardy perennial, in the field of telephone operation, depreciation, still demands the attention of the telephone husbandman. Like other weeds in other fields it must be controlled lest it choke out the good grain of operating profits. Tillers of the soil do not always use the same methods of controlling weed growth to prevent loss of crops and in the same way, workers in the utility field have developed different methods of controlling loss of investment through depreciation.

In the telephone industry we have become accustomed to one method and we have sometimes wondered that electric power and light and railway utilities have not adopted the same methods in handling their depreciation problems. Perhaps we have, at times, been a little critical of their methods. If we have, the address by Frank F. Fowle on the subject of "The Philosophy of Depreciation" given at the national convention will be enlightening.

Mr. Fowle's survey of the problem and his discussion of the underlying philosophy of the methods used in the telephone, electric light and power and steam railroad fields, indicates that the practices used in each field have not grown up without reason. It leaves a reasonable doubt as to whether any one method would be applicable in all three cases. Certainly the method in use in one field can not arbitrarily be applied in another without modification to suit conditions.

Experience of fifty years in the telephone industry has developed a method of handling depreciation which telephone men feel is best suited to their conditions. They are naturally concerned as to the wisdom of applying methods that have been developed in another industry. By all means, the telephone industry must be protected from the introduction of unsound methods, but in making this defense, the error should not be made to assume that methods inapplicable to telephone companies are unsound when applied to other classes of utility properties. A broad view of the matter is one that will permit each type of utility to apply the methods that its experience shows best to fit its conditions.

The Fight in Oklahoma

The long drawn out fight between the Oklahoma-Arkansas Telephone Co., of Poteau, Okla., and the Southwestern Bell Telephone Co. has reached another stage. The Oklahoma Corporation Commission after a hearing ordered conditions restored at Poteau substantially to those existing before the controversy began with the exception of restoration of service on a toll line to Fort Smith, Ark., which was denied for lack of jurisdiction. The case is now being carried to the State Supreme Court.

It is not the purpose here to comment on the merits of this case. Lack of all the facts alone would prevent that. It is unfortunate that difficulties of this type can not be adjusted amicably between the parties concerned and it is doubly unfortunate that the case has been given the wide publicity that it has received. Toll connecting agreements and toll revenue settlements are vital matters to most telephone companies but they can not be settled once for all by litigation.

While there are undoubtedly inequalities in the division of toll revenue in individual cases, they can not be settled on any fixed basis over the entire country. Conditions vary too greatly and the jurisdictions of commissions is different in the different states. It is a question if it can even be made a state-wide matter. After all it is a problem to be settled between the companies concerned in a spirit of fairness and give and take. It is to be regretted that the parties to the Oklahoma controversy did not find it possible to make a settlement on this basis.

Transients and Temperature Corrections in Repeatered Circuits

By F. J. DOMMERQUE
Fellow A. I. E. E.

If an alternating electromotive force is impressed upon an electric system, a more or less noticeable time will pass after the e. m. f. has been impressed until the steady or stationary state is obtained, because the energy committed to the circuit requires a certain time to distribute itself over the circuit. The oscillation to which the system is submitted during this short interval of energy distribution are designated as "transients"; after the transients have passed the unsteady state is condensed into the steady or stationary state.

In the ordinary alternating current problems the transient oscillations are also present but as a rule only the steady state conditions are taken in consideration, which are the periodic oscillations. In long distance telephone and telegraph lines, however, the transients gain on importance, whether the transmission is affected both ways or in one direction only.

John B. Carson of the American Telephone & Telegraph Co. discussed the theory of the transients extensively in a paper on the "Theory of the transient oscillations of electrical networks and transmission systems" in the Journal of the A. I. E. E., 1917; it would lead too far to go into this theory; for present discussion the transients in repeatered circuits only are of practical value. For

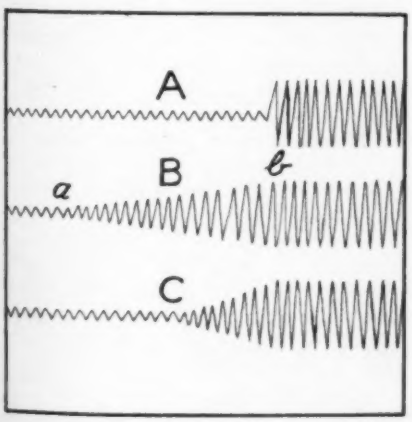

Figure 1

this reason a few oscillograms of the many taken by the A. T. & T. Co. will be utilized in our explanation, to illustrate the transients, namely the oscillograms recorded in A. B. Clark's paper on "Telephone Transmission Over Long Cable Circuits" (Journal A. I. E., January, 1923).

The upper curve marked A in Fig. 1 represents the e. m. f., respectively the 1800 cycle current impressed on a line loaded with 768 coils having a spacing of 1.4 miles and an inductance of 0.2 henry. The length of the line is 1,050 miles; it is an open wire line of No. 13 B. & S. gage. The capacity per coil section is 0.085 microfarad. There are six repeaters (21-type) inserted in the line. The center curve marked B in Fig. 1 shows the current at the receiving end. It takes approximately one-tenth of a second after the wave has been put on at the sending end until the arrival of the current makes itself evident at the receiving end. The point of the arrival is indicated by "a" in curve B. At "a" the wave commences its building-up process; it takes about 0.055 seconds for the wave to obtain its steady state at point "b." The oscillogram B clearly shows how the frequency of the received current grows from a very low value to the value equal to that at the origin of the wave.

At the interruption of the current at the sending station the oscillations will not die out at once, but a similar process takes place as the building-up process of about the same duration only the process is reversed; the frequencies at first decrease slowly from the breakpoint and then towards the end fast, the same as the frequencies in building-up increased first slowly and then faster. The dying-out process may be considered as the introduction at the time of break, of a second current equal in value to the first current but opposite in phase so that the sum of the two currents becomes zero, that is, one current annulls the other. From this phenomena it becomes apparent that a talking current impulse of a frequency of 1,800 periods per second becomes distorted to a considerable extent if steadily applied. Conversation over such a circuit would hardly be understandable, a peculiar metallic sound would be noticed.

The oscillogram marked C in Fig. 1 relates to a line of the same description as the one just discussed, the only difference being that this line is only half as long as the first one. In this case the propagation time of the wave is only of half the duration as before; also the time intervals for the building-up and the dying-out process of the received wave are cut in two. The intensity of this type of transients is directly proportional to the length of the circuit; whence the conclusion may be drawn that with the shorter circuit better, that is, acceptable results may be obtained.

The oscillograms in Fig. 2 indicate what happens when at the sending end an alternating current is applied with a frequency so high that no appreciable steady current can pass over the circuit, that means, the frequency lies outside of the principal speech-frequency range. The frequency at the sending end in this case is 2,400 cycles per second, length of

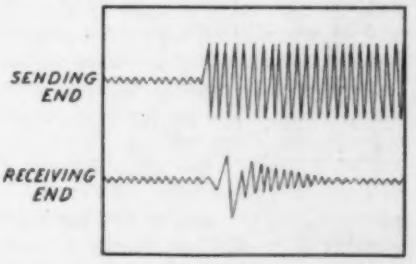

Figure 2

circuit is 350 miles; there are 256 loading coils in the cable, of 0.20 henries each and spaced 1.14 miles apart. The capacity per loading section is 0.085 microfarad. At the receiving end transients only make their appearance.

All oscillograms indicate that the effects of transients are much more detrimental at higher than at lower frequencies. The gage of the conductors is practically immaterial; the strength of the disturbance is a function of the ratio between frequency to be transmitted and the cut-off frequency of the loaded circuit. This cut-off frequency must be kept high on long lines, which can be realized by making the loading coil inductance very small and placing the coils shorter distances apart. This leads to extra light loading of long cable circuits as advocated previously.

In Fig. 3 an oscillogram is presented to show the transmission of a 2,000 cycle

wave over an extra light loaded cricuit 1,050 miles long with 924 loading coils of 0.044 henries inductance each, spaced 1.14 miles apart, and a capacity of 0.074 microfarads per loading section. There are 23 repeaters inserted in this line. This oscillogram indicates that the building-up time is considerably reduced in comparison to the building-up process in Fig. 1. The talking current pulses under 2,000 periods per second pass over such a circuit much less distorted, in fact the distortion is practically nil.

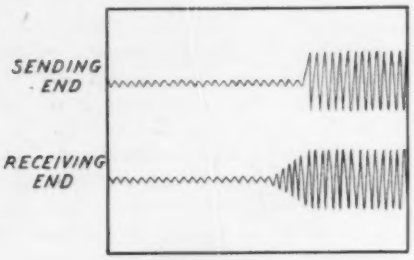

Figure 3

Prevention of Distortion

If the total transmission is kept constant by adjusting the individual repeater gains so as to balance thereby the transmission losses to a great extend, that is, if the difference between total loss and total gain in the circuit is kept constant, it is most probable that light loading will extend the distance greatly over which loaded cables are able to transmit satisfactory.

In this connection an example given by A. B. Clark may be cited. A four-wire circuit 1,000 miles long consisting of No. 19 B. & S. gage extra light loaded cable showed a total transmission loss of 500 miles, which is equivalent to $\beta l = 54.5$ or 530TU. The total repeater gain amounted to about 488 miles or $\beta l = 53.2$ or 517TU not including the loss in apparatus and connections to effect balancing, giving a difference of 12 miles or 1.3 βl or 12.7TU as the net equalent. From this example it may be learned that the repeater effect on such long lines is very high but also the loss, and that the grains are slightly below the losses. The difference is so small that a change in temperature as for instance the change brought about on aerial cable by a change from sunshine to rain or vice versa, may cause sufficient change in the energy received at the receiving end without a balance so as to lead to singing if the change is upward and to exstinction of speech transmission if downward. To prevent such disturbances it is necessary to confine the gains of the individual repeaters to narrow limits so as to obtain a constant total transmission equivalent; it is furthermore necessary to make provisions by which the resistance changes due to changes in temperature may be controlled and adjusted automatically, not to mention the care which has to be taken in the manufacture of the repeater tubes with regard to their high degree of uniformity in construction and operation. The plate potential of a commonly used tube is 130 volts with a limit of 5 volts up or down for variation. The gain must not vary more than 0.2 miles or 0.212TU or 0.0218 βl up or down. The gridvoltage should be 9 volts ± 1 volt and the gain variation not more than ± 0.3 standard miles or 0.318TU or 0.0327 βl. The filament heating current to amount to 1.25 ± 0.05 amperes with an initial gain variation of practically zero, and shortly before replacement of the tube of not more than a standard mile or 1.06TU or 0.109βl.

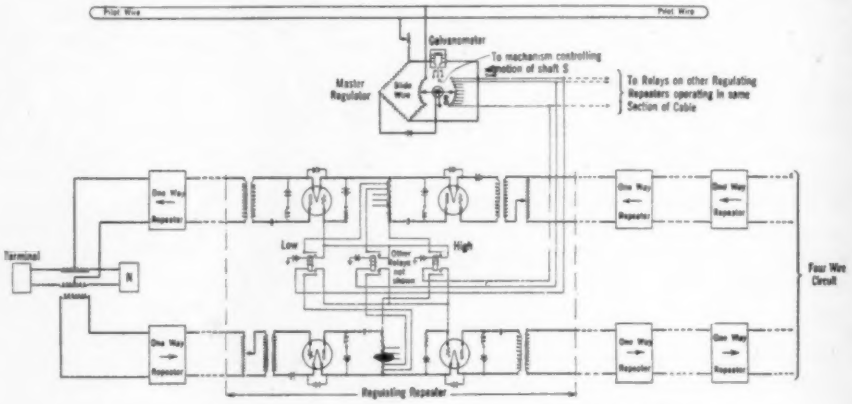

Fig. 5—Pilot Wire Automatic Transmission Regulator

The reader may find it rather far fetched that we devote so much time and space to subjects which may appear to him more theoretical than practical and which he may consider as lying entirely out of the sphere of his interest. The following are the reasons for discussion of subjects somewhat out of the ordinary. In the first place we attempt to tell a coherent story of telephonic phenomena starting with the fundamental principles and building up the structure as it developed by the addition of new inventions and improvements of one kind or other, in order to provide the reader with a sufficient over-all knowledge of modern telephony so that he can pick up a paper or book on any special telephone subject and read it and digest it. It is always presupposed that any telephone man of this age is interested enough in his work to welcome any opportunity which presents itself to enlarge his knowledge.

Although such subjects as transients and temperature regulation are—pertaining directly to long distance telephony, we devote the time to their discussion to show to the reader how these things influence the quality of transmission, and how any part and every part of the telephone plant, be it inside or outside of the exchange, is involved, so that everyone takes an interest in performing the work he is entrusted with, in the most perfect and intelligent manner because it forms part and parcel of the entire countrywide telephone system, and when one link in the chain is weak the whole structure becomes weakened. We therefore try to point out where disturbances occur and their causes, also the remedies, in the hope that it will bring the reader to a realization of the fact that his daily work, however small a part it may play, is a part of the universal telephone system and that failure in his small part may inflict untold damage to the whole.

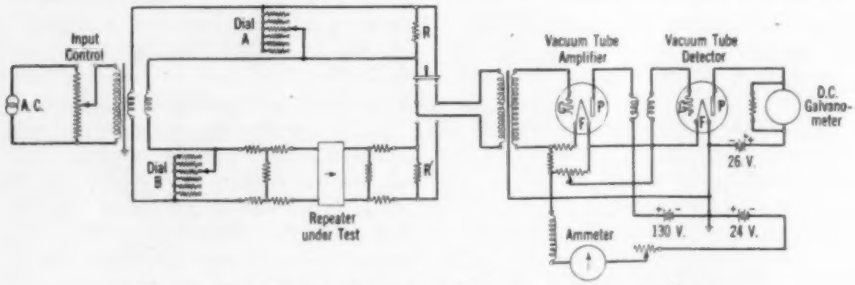

Fig. 4—Device for Measuring Telephone Repeater Gains

Measurement of Repeater Gains

The performance of any device can be observed only by measuring instruments or circuits. Tests must be made at regular intervals, without frequent and accurate tests it would be a difficult task to keep the repeater gains constant. A device and its arrangement to measure repeater gains is presented in Fig. 4. (Fig. 4 and Fig. 5 are taken from Clark's paper on "Telephone Transmission over Long Cable Circuits."). The two resistances R and R' serve to compare voltages. The resistance R is placed in the repeater circuit, the other resistance R' in a reference circuit. The repeater circuit consists of a vacuum tube amplifier and

a vacuum tube detector. The voltages are amplified across the resistances and then rectified to permit of reading on the direct current galvanometer. When equal deflections are obtained on the galvanometer, the voltages are equal and the repeater gains can be read directly from the dial scales A and B. The measuring circuits being composed solely of resistances, the reading will be independent of the frequency; whence the gains can be measured at all frequencies of importance.

Temperature Correction

In order to be able to regulate transmission automatically on long circuits, regulators are provided and installed at every third or fourth repeater station. How this regulation is effected and how the regulator is connected is shown in Fig. 5. A circuit is selected in the cable to serve as a pilot wire. A pilot wire extends over each regulator section, it controls the performance of the master regulator. The regulator itself is arranged after the order of a Wheatstone Bridge. The accessories required to automatically balance the bridge are omitted in the figure. In order to keep the bridge balanced the angular motion is transmitted to a shaft; the angular motion is proportional to the resistance variations taking place in the cable. The rotation of the shaft makes contact with conductors extending to relays, which control the repeater gains as shown in Fig. 5 for one repeater. By this process the repeater gains are raised and lowered automatically, which remedies any difference in the attennation caused by temperature variation.

John H. Wright Heads New York Automobile Association

The Jamestown, N. Y., Evening Journal of October 22 carried the following editorial:

"Announcement was made in the Journal Saturday of the election of John H. Wright, of this city, as president of the New York State Automobile Association. Mr. Wright is one of the pioneer motorists. He journeyed about the country in his automobile when the machines were aneathema to the rural population and rural speed traps flourished at every cross roads. He took part in the development of the automobile clubs of the state which from the beginning sought to curb this speed trap evil and various forms of freak legislation and which by the way was eminently successful. He is familiar with every phase of the history of the development of the state association which is now an influential organization in promoting or preventing automobile legislation as the case may be. His selection as head of the organization is a deserved recognition of his abilities. If he brings to bear the energy and the resources which he has displayed in the management of his numerous telephone properties, as undoubtedly he will, it is safe to predict that the power and influence of the state organization will be greatly enhanced.

The state organization has made an excellent choice. It will undoubtedly profit from his counsel and advice. . . ."

Almost every reader of TELEPHONE ENGINEER knows John H. Wright, vice-president and general manager of the Jamestown Telephone Corporation, either personally or through his connections in the telephone industry. The writer visited Mr. Wright back in 1913, when the automobile industry was almost in its infancy, but he had one of the latest model cars of that date, and the way he covered the ground made us realize the necessity for better roads. We want to add that he is the best qualified man in New York for the head of this important organization.

Telephone Engineer Incorporated Stockholders Telephone Operators

TELEPHONE ENGINEER PUBLISHING COMPANY has been granted a charter and the first meeting of directors was held October 17 at Chicago. The purpose of the organization is to take over TELEPHONE ENGINEER, which has heretofore been owned and operated by J. A. Smith.

It is believed this reorganization will bring about a closer relation between operators of Independent telephone properties and the publication, and that TELEPHONE ENGINEER can be made of greater usefulness to the industry it represents. Covering, as it does, the technical field as well as other departments of this great public utility, it is felt by those behind the move that it has a wide field and a bright future.

The policy of TELEPHONE ENGINEER for the immediate future at least, will remain as heretofore.

The first board of directors is as follows:

C. L. Jones, Secretary-Manager, Athens Home Telephone Co., Athens, Ohio.

Walter J. Uhl, General Manager, Logansport Home Telephone Company, Logansport, Ind.

John H. Wright, Vice-President and General Manager Jamestown Telephone Corporation, Jamestown, N. Y.

F. A. Bowdle, Manager Inter-County Telephone Company, Cerro Gordo, Ill.

P. Kerr Higgins, General Manager, Scotia Telephone Company, St. Louis, Mo.

Harold L. Beyer, Attorney, 1060 The Rookery, Chicago, Ill.

R. B. Still, General Manager, Gulf States Telephone Co., Tyler, Texas.

W. S. Paca, General Manager, Petroleum Telephone Company, Oil City, Pa.

E. H. Hendricks, Crosbyton, Texas; Guymon Telephone Company, Guymon, Okla.

Roy F. Smith, Broker, Fort Worth, Texas.

J. A. Smith, Publisher, Chicago, Ill.

The following officers were elected:

J. A. Smith, Chicago, President and Treasurer.

C. L. Jones, Athens, Ohio, Vice-President.

F. A. Bowdle, Cerro Gordo, Ill., Vice-President.

D. Weiner, Chicago, Secretary.

New York Exchange Building Largest in Industry

The first central office in the New York Telephone building at 140 West street, the largest telephone building in the world, will be opened at 8 p. m., Saturday, November 3, when "Barclay," a new dial unit, will be cut into service.

On the same day at midnight another new uptown dial unit, "Medallion," will also be cut into service in the Telephone building at 206-240 West 36th street, making the fourth dial office in that building.

The "Barclay" office which will have a capacity for sreving 20,000 telephones is the first of four similar units to be installed in the next three years in the building on West street to help meet the growing service demands of downtown Manhattan. These four units will later be supplemented by the addition of two more dial offices, making a total of six units, capable of serving 120,000 telephones.

Designed for the dual purpose of providing administrative headquarters and an operating center, the New York Telephone building occupies the entire block bounded by West, Barclay, Washington and Vesey streets. For the past two years the greater part of the floor space of the building has been used as general office space for 6,000 of the company's administrative and clerical workers. The new Barclay dial unit occupies part of the space of the second, third, fourth and fifth floors, on which floors the entire six units eventually will be housed.

Now, Doctor

She: "Doctor, why does a small cavity feel so large to the tongue."

Dentist: "Just the natural tendency of your tongue to exaggerate, I suppose."

Annual National Convention Strictly Business

Annual Gathering of Independent Telephone Men Resolves Itself Into a Business Organization to Solidify the Interests of the Industry. Large and Enthusiastic Attendance.

One of the largest gatherings of Independent telephone men that has assembled for many years occurred at the convention of the United States Independent Telephone Association at the Hotel Sherman in Chicago, October 16, 17, 18 and 19. Not only was attendance apparently in excess of other years but the exhibits of manufacturers and suppliers were most complete and attractive and the business and entertainment sessions were packed full of interesting features. The sessions opened at 2:30 on Tuesday with President F. B. MacKinnon in the chair.

The opening session was devoted to the reports of officers and divisional chairman of the association. Chairman W. L. Lemon of the accounting division reported the work of his division since the last annual convention. The accounting committee held two meetings in addition to the meeting at the time of the Class A conference in June. In November, 1927, matters relating to the Interstate Commerce Commission's order No. 14700 concerning depreciation were discussed with representatives of the bureau of accounts of the commission and of the Bell System. In May, 1928, a meeting with representatives of the Bell system was held to discuss an initial draft of a proposed revision of accounts for telephone companies. The work for the future will be pretty definitely along the lines of working over suggestions for presentation to the Interstate Commerce Commission in connection with its proposed revision of accounts. During the year the accounting committee suffered a loss by death of one of its members, Mr. Fred C. Mendeck of Whittier, Cal. James S. Campbell of Whittier, Cal., is Mr. Mendeck's successor.

Secretary C. C. Deering then presented figures showing the financial condition of the association and its membership statistics. The association has a membership of 608, being made up of 505 operating companies, 61 manufacturers and 42 members of various special classes.

The activities of the Washington office of the association were then related by Alfred L. Geiger, general attorney for the association. The Washington office is called to handle a wide range of matters principally in connection with relations to the various units of the federal government. The most important development of the year was the so-called wire tapping case decision by the supreme court. The radio situation, the revenue act of 1928, federal tax matters and depreciation hearings of the Interstate Commerce Commission were also made the subjects of brief comments.

R. F. Wilder of St. Paul, Minn., chairman of the commercial division, next reported the completion of the formal organization of the division by the appointment of the various district chairmen. The work of the division is proceeding along the lines of discussion of various commercial practices such as types of rate schedules, service connection charges, contract and collection practices and directory work. It is the plan to provide for attendance at various state and district meetings of representatives of the division to discuss some phase of commercial work.

Due to temporary indisposition, Mr. A. L. Stadermann was unable to be present at the afternoon session and his report of the work of the plant division was read by R. V. Achatz. The report dealt largely with work of standardization being carried on through the American Engineering Standards Committee with which the association is co-operating. Standards of importance to the telephone industry were adopted during the past year. Among them were the National Electrical Safety Code revision, the National Electrical (Fire) Code revision and standards for insulated and bare copper wire. Standards of purely telephonic interest are now receiving more attention and it is hoped that attention may soon be given to standards for outside and inside plant construction work.

The work of the traffic division was then briefly reported by Secretary C. C. Deering who spoke of the preparation of an instruction book of local operating practices for small and medium sized offices. A correspondence course based on the book has been inagurated which has already been completed by 48 operators. The total enrollment in the long distance operating course has been 1,731, and 747 operators have completed the work and received diplomas. After appointment of the nominating committee to present names of successors for retiring directors, the session adjourned.

Schedule of Conventions

South Dakota Telephone Association convention, Sioux Falls, Cataract Hotel, January 15-17.

Minnesota Telephone Association convention, St. Paul, Hotel Lowry, January 22-24.

Ohio Independent Telephone Association convention, Columbus, Deshler-Wallick Hotel, April 16-18.

Indiana Telephone Association convention, Indianapolis, Claypool Hotel, May 7-9.

Meeting of State Association Officials

Officials of the various state associations met at dinner Tuesday evening and after the meal, the general attorney of the national association. Alfred L. Geiger spoke at length on the Olmstead case or "wire-tapping" case recently decided by the United States Supreme Court. It is Mr. Geiger's opinion that there is nothing in the decision that requires telephone companies to furnish means for federal or state officers to secure evidence by tapping telephone wires. On the other hand it is a positive duty of the companies to protect their systems and subscribers from outside interference. The discussion turned to the question of the duties of telephone companies in assisting law enforcing officials in getting evidence and apprehending criminals or those suspected of crime. In general, it was the opinion that each case would have to be decided for itself in light of the conditions present.

Session on Executive Problems

The session on the morning of Wednesday, October 17, was described by President MacKinnon as being devoted to problems of a broad nature such as were met by the general executives of telephone companies. The first address was on the subject of "Additional Revenue Possibilities from the So-Called Special and Supplemental Telephone Services" by H. F. McCulla of the Lincoln

Telephone and Telegraph Co. Mr. McCulla's opening admonition was to get our business out onto the highways where it could be seen. Heretofore we have been concerned with the development of the principal source of revenue, the sale of main station service. We now have the foundation and can undertake to interest the public in additional and supplemental service. When saturation comes, we must sell supplemental service to keep advancing.

Supplemental service may be sold by the use of personal contact or the printed word. One of the most effective methods is through the commercial service survey. Heretofore, telephone companies have prescribed both the service and equipment for the subscriber along certain set lines. The commercial service survey studies the type and location of equipment needed, its use and the traffic load. As an example of what may be done was cited the case where a survey of 16 business institutions resulted in an increased revenue to the telephone company of $6,000 per year. Other personal contact methods are across the counter sales, use of salesmen and solicitors, and revenue development campaign by company employes.

Through the channel of the printed word, sales may be made through newspaper advertising, window displays, inserts and pamphlets and motion pictures.

Mr. McCulla then listed the various types of supplemental service which may be sold at a profit to the telephone company. Among them are extension telephones, gongs and bells, public address systems, remote control radio receiving service, wiring plan, pbx swithboards including cord, cordless and intercommunicating type, monophone sets, shelves for desk stands, head receivers, special sets for use of deaf persons and toll service. The final goal is the saturation of both main station and supplemental service.

The next address on the Wednesday morning program was given by Frank F. Fowle, consulting engineer of Chicago. Mr. Fowle spoke on "The Philosophy of Depreciation," discussing the various methods employed by telephone, electric power and light and railroad companies in making provision for protection of the investment against losses arising from depreciation of physical property. Mr. Fowle's paper is given on other pages of this issue.

President MacKinnon's Annual Statement

In accordance with custom, the annual statement of President F. B. MacKinnon of the national association dealt with fundamental conditions in the telephone industry and particularly those which affect the Independent group. It has been recognized that there are two groups in the telephone industry, the Independent group and the Bell group and it is agreed among men in both groups that the preservation of the two groups is essential to the industry. Independent companies, whether they recognize it or not, are a part of that group and must be controlled by the majority of the group in their relations outside the industry.

The national organization represents a great majority of the capital and station development of the Independent group, and every Independent company, whether or not it is a member of the association is dominated by the opinion and attitude of the national association. Therefore any company whether or not a member of the association can not sell its property to the Bell group. There is a standing arrangement by which the Bell companies notify the association whenever they think that the acquisition of Independent property is desirable or necessary.

The national association is an association of operating companies, not of owners of companies. It is interested in the welfare of the companies regardless of the owners. It is more interested in the operation of the companies than it is in the personnel of the ownership. It is not opposed to the introduction of new owners among telephone men, but it is opposed to the introduction of methods of operation contrary to those which experience has shown to be to the best interest of the Independent group.

Responsibility to the public and to the Bell system make it necessary to follow through in this matter. Men who come into control of Independent properties can not turn that control over to the other group as this is contrary to agreements between the groups.

As the second observation, Mr. MacKinnon spoke of the fundamental differences between the telephone industry and the power and light industry, being led, as he said, by the fact that many of the newcomers in the telephone business were familiar with the power and light field. Among the fundamental differences are that the telephone company owns all of the equipment and rents the service. The power and light company makes no investment in fixtures or equipment on the customer's premises. Another fundamental difference is that the economy of consolidation of small units is not often realizable in the telephone field. Again the field for growth of business in the smaller communities is still very much greater for the power and light utilities than for the telephone service.

On account of these fundamental differences, the association has felt justified to say to those who are coming into the business, "Stop, look and listen." The association gladly welcomes all newcomers into the business; it wants the operating companies as members and it welcomes into the Independent industry all of the best brains that it can get hold of.

Statistics of the various companies show a growth of 40,000 stations in 1927 against a growth of 120,000 stations in 1926 for Class A, B and C companies. Class C companies show an actual loss in stations. Fixed capital investment is slowly creeping up, due to higher construction cost. The operating ratio or the ratio of all expenses to all revenues has stood practically constant at 76 per cent for several years.

As a whole, the Independent industry is in a very strong position. The only danger lies in a disturbance of its financial position. For the maximum success the companies must be operated by telephone men using telephone methods.

Accounting Conference

Wednesday afternoon was given over to conferences of the various divisions of the association. The accounting division met under the leadership of Chairman W. L. Lemon. "Revenue Accounting," by Ranford Dunlap, assistant auditor, Diversified Investments, Inc., Kansas City, Mo., was the first paper. Mr. Dunlap summarized the various operations in revenue accounting and applied the summary to various sized companies. He emphasized the necessity of accurate accounting of revenue.

The second paper on the subject, "An Economic Interpretaion of Accounting," was given by E. O. Mallott, of the School of Commerce of Northwestern University. Accounting as interpreted by the speaker in writing the history of a business and without accounting no business could grow beyond the ability of a few individuals to comprehend its details. Mr. Mallott's paper was followed by the description of various machines for performing accounting operations which was given by A. C. Daunis of the Burroughs Adding Machine Co. A discussion of income tax matters especially relating to deduction of local taxes and other matters of general interest continued until late in the afternoon.

Commercial Conference

The conference of the commercial division attracted a large attendance. Chairman R. F. Wilder, presiding, announced the completion of the commercial committee by the appointment of Ernest Irwin of Pomona, Cal., as chairman of the southern California district. Harry M. Engh, general manager of the Mutual Telephone Co., Erie, Pa., was prevented by illness from attending and the program was largely given over to a discussion of directory matters following a paper on "The Telephone Directory" by B. C. Schweitzer, commercial superintendent of the Home Telephone and Telegraph Co., Fort Wayne, Ind.

Three phases of the telephone directory

(*Continued on page* 31.)

Practical Suggestions for Plant Valuation

By CHARLES W. McKAY, M. E.*

Preliminary Discussion of Unit Costs

Importance of Unit Costs: It is hard to say which phase of the appraisement problem is more important, the inventory of the physical property or the preparation of the unit costs. One thing we do know, however, and that is, assuming honesty of purpose and a reasonable degree of efficiency on the part of the field inspectors, most of the inventory errors will be found compensating. For instance, errors of omission in inventorying the wire plant will probably be nearly offset by errors of commission.

Experience has proven, however, that plant is *more frequently left out entirely*, than duplicated; hence the almost universal practice of adding a specific allowance to the reproduction cost of the inventoriable property to cover omissions. However, if an erroneous assumption is made as to the labor or material costs when building up the wire unit costs, and if these unit costs are used as a basis for appraising all of the wire plant, it will be readily seen that a serious error may result. Then, again, a regulatory body is much more likely to make a detailed analysis of the unit costs than of the inventory of physical property.

A few errors in the unit costs—even if they are of a minor nature—may tend to cast suspicion on the entire appraisal, including inventory, collateral costs and intangible values.

It will therefore be seen that the preparation of the unit costs is a most important feature in the appraisal of telephone properties. This portion of the work should be carried on under the direct supervision of the appraisal engineer, and every unit cost, before it is applied to the inventory, should be subjected to the most careful analysis by the appraisal engineer, and should be checked by every available means. For obvious reasons the unit costs, if determined by a disinterested appraisal engineer, will carry more weight before reviewing bodies than if prepared by an engineer who is an employe of the company submitting the appraisal.

Fair Material Prices for Appraisal Use: With this data—the market prices for the various types of equipment as of the appraisal date and for the several years preceding the appraisal—tabulated in proper form, the determination of fair material prices for use in the appraisal under consideration is a comparatively simple problem.

It is possible that the reader may gain the impression from the foregoing discussion that average prices for the several years preceding the appraisal should be used in all cases. This is not necessarily true. Take, for instance, the present material market. It is undoubtedly true that the conditions resulting from the present prices will continue to affect the material markets for some years to come.

Obviously the appraisal engineer in deriving fair material prices as of the present date must take into consideration the fact that although prices are higher now than they have been for some years past, there is every reason to suppose that present market conditions will prevail for some years to come.

In the last analysis a determination of fair material prices, as of the appraisal date, is dependent not only upon the prevailing prices for the several years preceding the appraisal, but also upon the possible market trend during the several years following the appraisal.

The appraisal engineer must take into account: First, past market conditions; second, market conditions as of the appraisal date; and third, the probable trend of the future material market. In other words, having all of the available facts in his possession bearing on the problem under consideration, the appraisal engineer must use his best judgment in determining fair material prices for the appraisal in hand.

Unit Labor Costs: The labor cost study is considered after the fair material prices have been determined. Work orders and completed estimates for the several years preceding the appraisal should be carefully reviewed, and all possible data pertaining to the cost of setting poles, placing cross arms, stringing wire and cable, building conduit, etc., should be tabulated in such a form as to render possible a careful analysis of past and present labor conditions.

The utmost care should be exercised in selecting records of completed work that represent average conditions—conditions that approximate as nearly as possible those that would probably be encountered in reproducing the plant *as of the appraisal date.*

Obviously, unit costs derived from job orders covering small installations cannot be considered as representative for the purpose under discussion. Unit labor costs are necessarily much higher for piecemeal than for wholesale construction.

Another and a very practical source of unit cost data will be found in the foremen in charge of the various construction and installation gangs. Many telephone foremen, for their own information, keep a detailed record of the time spent on the various kinds of work falling under their jurisdiction.

It is also true that men who have been in the employ of a company for a long period of time are apt to be well posted as to soil and subsurface conditions encountered in the original plant construction.

Use of Curves to Show Fluctuations of Prices:—When all of the available sources of information have been properly tabulated, the resultant data should be a great help in the determination of fair unit costs. In this connection, curves showing graphically the fluctuation of material and labor prices over the period of years preceding an appraisal will be found a material help to the appraisal engineer.

Unit Costs and the Inventory:—Long before the completion of the field work the unit cost study should be well under way, and every effort made to complete each set of unit costs by the time the corresponding portion of the inventory is finished. In this way the confusion, so often noticeable during the last stages of a public utility appraisal, may be entirely avoided.

The pole and wire inventory is usually the first to be completed in the field. By having the pole and wire unit costs ready for use immediately upon completion of the inventory, this portion of the appraisal may be disposed of in a comparatively short time.

Material Prices at Time of Appraisal:—The first step in the preparation of the unit costs consists in the determination of material prices as of date of appraisal. Quotations should be secured from dealers in, and manufacturers of, every class of equipment found in the plant. For equipment usually purchased on a competitive basis—poles, cross arms, wire, cable and conduit—quotations should be secured from a number of concerns. Highly specialized equipment, such as telephone switchboards, private exchanges and subscribers' instruments, can, as a

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rule, be exactly reproduced only by the original manufacturers, and every effort should be made to ascertain prevalent market prices of various apparatus and material as of the appraisal date.

Determination of Material Prices for Period Preceding Appraisal: — Having obtained all possible data relative to fair prices, as of the date of appraisal, the next step involves the determination of corresponding prices for the several years preceding the appraisal. Usually the best way to accomplish this end is to assign one or more men, according to the individual requirements of the case in hand, to the task of reviewing the company's invoices for the several years preceding the appraisal.

For each class of material the following data should be noted: date of purchase, quantity purchased, name of manufacturer or dealer, the total cost and the unit cost.

Prices that seem abnormally high or abnormally low should be carefully investigated before they are accepted for use in the final determination of the unit costs.

Unit Costs for Real Estate and Equipment.

Land Appraising and Purposes:—As has been previously stated in the discussion of land, courts and commissions have usually ruled that the appraisal of a utility corporation's land should not be made by a consulting engineer, but rather by a real estate expert. Nevertheless, even if a competent expert is employed for this portion of the work, it is always well for the appraisal engineer to carefully verify the findings of the expert.

It frequently happens that appraisals are made for other purposes than as a basis for rate making. The writer has just completed an appraisal of the property of a small telephone company located in a State where public utility corporations are not at the present time subject to dictates of a public service commission. This company merely desired to gain as accurate a knowledge as possible of its tangible and intangible assets, so that it would be in a position to properly administer its financial affairs.

Cases of this kind are numerous, and with the thought that the employment of a separate real estate expert for land appraisal is a rather expensive proposition, it is proposed to consider this subject of land unit costs and land appraisals more specifically than was done in the foregoing treatment of the subject of land inventories.

Differing Opinions as to Theory to be Used in Land Appraising:—The proper method of appraising the land of a public utility corporation is a subject upon which there is a marked difference of opinion between experts. It has been argued that there is no logical reason why land or right of way belonging to a utility company should be considered on a different basis from that of similar property owned by an individual. On the other hand, it is unquestionably true that the development of utility properties has often increased the value of the adjoining land. This is especially true in the case of railroads.

Land along a railroad right of way is obviously much more valuable after the railroad has been built than before. Some experts argue that in evaluating the land or right of way of a railroad company this fact of increased values of adjoining properties should be given due weight, and the railroad allowed to benefit by the general increase in prices.

If this theory is conceded to be a reasonable one, then it, of course, follows that the utility corporation must suffer the consequences if the use made by it of certain parts of its plant has caused a decrease in the value of the surrounding property. It will be readily seen that the use of land for car barns, storage yards, etc., may be considered objectionable in a residential district, and may cause a decrease in surrounding property values.

The attitude of the courts on this subject is evidenced by the following quotation from the Columbus Southern Railway v. Wright, 151 U. S. 481:

"The value of the land depends largely upon the use to which it can be put, and the character of the improvements upon it."

Methods of Appraising Land:—There are two generally accepted methods of determining the value of land—first, the expert method; and second, the sales method.

Each of these methods has been subjected to a good deal of criticism. Hence in appraising the land of a telephone company, as already suggested, it is usually advisable to employ both of these methods, so that if one of them is objected to by the court or commission in question, the other may be substituted.

Expert Method of Land Appraisal:—The expert method, as already stated, consists of the appraisal and description of the land by competent local real estate experts. If the land under consideration is valuable, and if its value forms an appreciable portion of the total value of the plant, it is advisable to employ two or more experts to work upon the problem independently.

In a case of this kind a fair value of the land in question may often be obtained by averaging the respective values submitted by the experts. This latter plan, however, has the disadvantage of disqualifying the experts for testimony before the commission. Of course, no expert will be willing to take the stand and testify to a modification of his original estimate.

If this averaging plan is employed in determining the value of a telephone company's land, it should be accompanied by a careful and detailed explanation of just how the final value of the land, as submitted in the appraisal, was obtained. Then if the court agrees to the propriety of averaging the land valuations submitted by a number of experts, the experts may be subsequently called to verify their individual estimates.

Sales Method of Valuing Real Estate:—The Wisconsin Railway Commission, in the case of the State Journal Printing Co. v. Madison Gas & Electric Co., discusses the sales method of valuing real estate. It says:

"The sales method of valuing real estate was used partially in the Michigan Railway appraisals of 1900-01 and in the light of the experience gained in that work the method was adopted in the Wisconsin steam road valuation made under the provisions of the ad valorem assessment law of 1903. It has since been extensively used in Wisconsin and elsewhere in connection with important valuations of public service properties for both rate-making and taxation purposes, and is generally accepted as a valuable aid to the judgment by experts engaged in such valuation work on a large scale."

The sales method may be defined as a plan or process for the systematic collection and comparison of data relating to real estate transfers for the purpose of estimating true market realty values. It consists in a study of the transfers of neighboring property having conditions or characteristics similar to the land whose value is to be determined, and is intended to duplicate, as nearly as may be, the mental or judicial processes ordinarily employed by the so-called "local real estate expert," with a view to arriving at results approximating those which would be reached by such local expert acting without bias or suggestion.

The sales method is capable of application in a variety of ways; in fact, is as flexible in its possible applications as are the various methods employed by individual local experts. Two interpretations of the sales method have been most commonly employed. In one of these the area and consideration in each sale of similarly situated land is found, and the average unit price—per square foot, per foot frontage, per lot, per acre, etc., ascertained, and this unit applied to the tract under investigation.

The other application of the method introduces what, in many cases, is believed to be an additional safeguard, consisting of the use of the average assessed value of adjacent or similarly situated lands in combination with an average ratio or percentage representing the relationship of the assessed value of transferred lands to the total consideration paid for such transferred lands in the district or locality under consideration. All of these figures

being based on the "ground values" exclusive of the improvements thereon.

Such use of assessment figures is designed to introduce, as far as may be, the results of the judicial processes of the assessor, who, at least in theory, serves on behalf of the public as an unbiased expert in the matter of relative valuations, and who attempts to make allowance for the peculiar attributes or characteristics of individual parcels of real estate in any given locality or neighborhood of a city.

In the broader and more flexible applications of the sales method, the expert adopts one or the other of the processes just outlined, or blends the two together in such fashion as to yield the most consistent and trustworthy final result. In the process of valuing a tract of land involving conflicting data, as in the case under consideration, the expert user of the sales method on this flexible basis derives a series of tentative results similar to the results representing the judgments of individual local experts.

The judicial function involved in the discriminating selection of data and in the derivation of final results is exercised along essentially parallel lines with the two classes of experts here compared. The further act of the judgment in selecting a final preferred valuation figure in the light of a group of preliminary or tentative results is identical in the two cases.

In the particular valuations here considered, the similarity of the basis is further emphasized by the fact that the results by the sales method represent the composite judgment of four members of the commission's expert staff, as against an equal number of local real estate experts employed by the company. Although it is frankly conceded that the tentative land valuation figures first reported were derived by a comparatively restricted application of the sales method, issue is here taken with certain claims made in the argument by counsel for company. In view of the repeated favorable reference by counsel to the judgment of the assessor with respect to relative values (argument on behalf of company pp. 30, 31, 32, 37, 39), the criticism of a similar use of the assessor's judgment by the commission's experts need scarcely be considered, except with respect to the misapprehension by counsel (argument, p. 43) as regards the fluctuation of the assessment ratio in Madison.

Entirely aside from the claim that assessment ratios should not be depended upon in making land valuations, counsel contends that, in any event, a general assessment ratio should not be used in the case under consideration, chiefly because of a supposed "radical difference as between different sections or localities" in the city of Madison.

In the December installment we will discuss the subject of Costing the Buildings—and, also, prescribe detailed methods for building up the pole, wire and cable unit costs. As suggested in the September issue, this phase of the subject of valuation work is *most important.* The most accurate inventory in the world is practically useless unless the unit costs are fair and suitable.

American Program Service Association Holds Meeting

In conjunction with the annual convention of the United States Independent Telephone Association was held the annual meeting of the American Program Service Association on Friday, October 19, at the Hotel Sherman, Chicago. A large number were in attendance to hear the series of excellent papers on the subject of program service.

President J. A. Gustafson was in the chair and first introduced Alfred L. Geiger of Washington, D. C., general attorney of the United States Independent Telephone Association. Mr. Geiger spoke on "The National Radio Situation," outlining the problems before the Federal Radio Commission. Following Mr. Geiger, H. T. McCaig, assistant Chicago manager of Stromberg-Carlson Telephone Mfg. Co., presented a paper on "The Trend of Program Service." Mr. McCaig spoke of the first program service over telephone lines many years ago and spoke of the present development as being largely the work of telephone men. Two methods are being developed, one using carrier waves and the other using an audio frequency system. Programs are obtained in a number of ways; from the air by means of radio receivers, from phonograph records or original programs by means of microphone pick-up.

F. C. Young, of the engineering department of the Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., then followed with a discussion of "Technical Aspects of Program Service." Mr. Young showed schematic diagrams of the audio frequency type of program distribution system and indicated the conditions necessary for satisfactory reproduction.

"Our Progress" was the subject assigned to L. O. Painter, chief engineer, Program Service Co., St. Paul, Minn., who told of the development in St. Paul to a system of over 2,000 users. Among the points to be considered were that the highest possible grade of program must be furnished, the cost of operation and installation must be carefully considered and that a tried system should be used.

The next speaker was George R. Eaton, chief engineer of the Kellogg Switchboard and Supply Co., who spoke on "Future Possibilities." Mr. Eaton indicates the advantage that telephone companies have for this type of service as their outside plant is already in place. Future sources of program may include local programs, programs received by wire and programs from short wave broadcasting stations. Also film type programs are a possible source. Mr. Eaton described a multiple program system using carrier current for distribution.

The last speaker on the program was R. S. Brewster, vice-president, Public Program Service, Lincoln, Neb., whose subject was "The Public, the Radio Dealer and the Broadcaster." Mr. Brewster spoke of the great strides made in solving the problems of program distribution. It does not take away the opportunity for the radio dealer as it furnished service in many places where direct radio reception is impracticable. Ultimately, Mr. Brewster believes, some or all of the programs will come by wire.

Mr. Geiger was then recalled for opinions on some of the legal question involved. The session ended after the election of the following men to serve as directors for the ensuing year: George B. Quatman, Lima, Ohio; Howard I. Crawford, Wausau, Wis.; Foster McHenry, Jefferson City, Mo.; W. S. Paca, Oil City, Pa., and R. V. Achatz, Aurora, Ind.

President of Brazil Selects Stromberg-Carlson Radio

Stromberg-Carlson's Brazilian representative, Luiz Corcao, is rejoicing over the fact that he has sold and installed a No. 744 Stromberg-Carlson combination instrument in the Palacio Guanabara, the Palace of the President of Brazil. The Stromberg-Carlson No. 744 instrument contains an all electric, seven-tube radio receiver and an electrically operated phonograph. The phonograph music is picked up by means of an electromagnetic pick-up outfit, and is passed through the audio amplifying tubes of the radio receiver, and reproduced through a cone loud speaker in the same manner as radio music.

This instrument sells for $1,245, east of the Rocky Mountains, and is, of course, proportionately more in Brazil. It is equipped with five wall type loud speakers, placed in different parts of the Palace.

The president enlisted the services of the director of the telegraph department in making the choice of a radio receiver, and it was through the director's acquaintance with Stromberg-Carlson quality through the Stromberg-Carlson telephone system that has been in operation there, for so many years that the Stromberg-Carlson was selected.

Studying Telephone Methods

By E. R. COLLINS

Manitoba Telephone System, Brandon, Manitoba, Canada

CHAPTER 22

We have been studying about the different types of signals used for the central office switchboards. In every case the signal has consisted of an electro magnet, or a lamp, connected to a line jack. The line jack has been so arranged with springs to cut off one or both sides of the signal from the line, when the operators plug was inserted.

With all these systems the calls received and the calls going out from or to any telephone, are all routed over the line jack. In small systems this is quite satisfactory, but in the larger systems it is impossible for an operator to reach all the lines of the system from one position. By the use of transfer trunks and order buttons, the size of the switchboard using the ordinary line jack and signal can be used. We will discuss the use of trunks and order buttons in a later chapter. We will now discuss some of the features of the multiple switchboard, and see how it overcomes the difficulty.

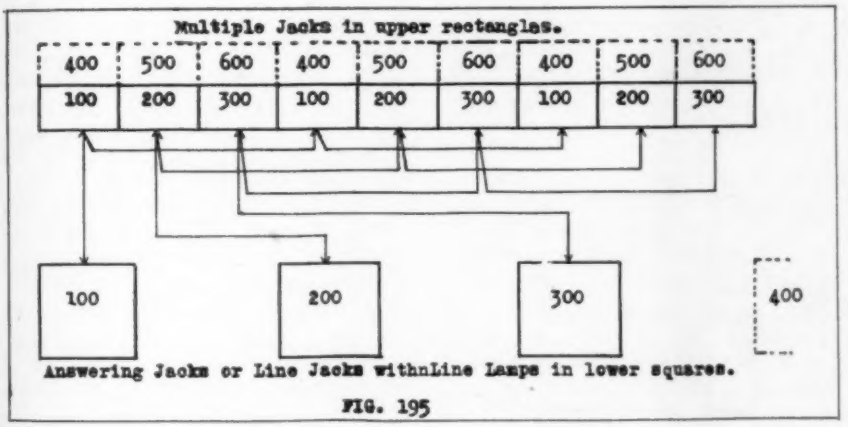


FIG. 195

In Fig. 195 we have drawn a few squares and rectangles to represent the front of a multiple switchboard. Commence with the large square at the left marked (100). In this square we will suppose there are 100 line jacks and line signals either of the bulls eye type or the line lamp type. The bulls eye type of course will occupy a much larger space than the lamps. However, with either type we can use the arrangement shown. Next in the rectangles above you will see that 100 appear in three different places. At any of these places, it is possible to plug into any line in the 100 group and ring the telephone.

When a subscriber calls the operator by lifting off the receiver the signal will come in on the signal which is in the lower left hand square. The operator inserts her plug into this line jack and answers the subscriber. The line signal is disconnected from the line by inserting the plug.

When a subscriber is called, the operator will use the upper or multiple jack to call. Inserting her plug in any of the upper multiple jacks will disconnect the line signal.

When such a system is increased in size, the line equipment is added as shown on the dotted square to the right and of course the multiple equipment must be extended as well.

Series Type Multiple

There are two distinct types of multiple systems, the series and the bridged. The system used in the series arrangement is shown in Fig. 196. The line jack and line signal are shown at the bottom of the drawing. The bulls eye type of signal with a double winding is used. Here battery feeds out through the two windings through the series contacts of the line jack, and the series contacts of the multile jacks, "A," "B," and "C" to the line and telephone. When the telephone receiver is removed the battery flow operates the signal. The operator observing the signal inserts her plug in the line or answering jack, and cuts the signal circuit, and connects her cord circuit to the telephone. The line signal being de-energized, restores to normal. While this subscriber is connected to the cord circuit at the answering jack, it is possible for another operator to plug in at any of the multiple jacks and cut off the subscriber from the cord circuit at the answering jack. To prevent this occurring, the operator is provided with a busy test.

Series Multiple Busy Test

In the circuit, Fig. 196, the sleeve of the plug in the answering jack, is connected to positive or ground battery. Thus when the plug is in the answering jack, or any of the multiple jacks, all the sleeves of the jacks connected to this line will be grounded. When the operator at Jack "C" wishes to call this line, she first touches the tip of her plug to the sleeve of the jack to be called. If there are no other plugs in the jacks of this line, the sleeve of the jacks will be dead. There will be no signal given to the operator, so she may now push the plug all the way into the back. But if the line is being used at any other position, the sleeve of the jack will be grounded. Then a circuit can be traced from the grounded sleeve of the multiple jack "C" back through the ½ winding of the cord signal to negative battery. This will operate the card signal at least part of the way, and give the operator a visible signal. At the same time, she will receive a click in her receiver if the key to the cord is open.

Trouble in Series Multiple

If there should be a short circuit in the series multiple jack system, the line signal will be operated permanently. If an open plug (that is a switchboard plug to which no cord is attached, and the three parts of the plug are not connected together), is inserted in any of the jacks, the line can be cut in sections. Since most of the trouble in this class of equipment is found in the jacks, the trouble can be cornered to at least two jacks.

One very common trouble in the series type of multiple system is caused by poor contact in the jacks. Each series contact is a possible place for trouble. We

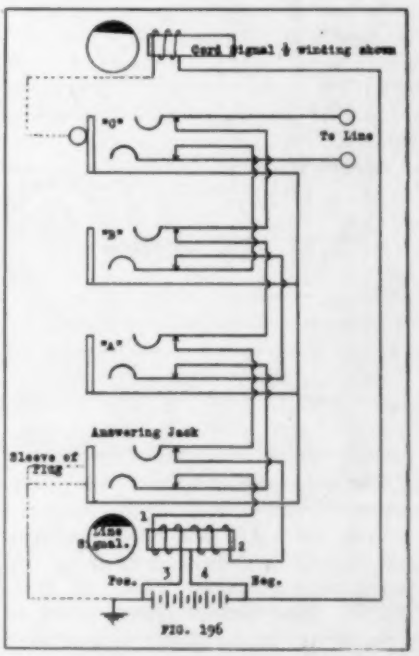


FIG. 196

will suppose that the subscriber cannot call the operator. The line would be tested naturally to see whether the trouble was inside or outside. If inside, a short circuit across the line terminals will fail to operate the signal. Now take a small screw driver and insert in the line jack, so that the tip and ring springs will be shorted, but not far enough to open up the contacts. The sigual should operate. If it does, then proceed to the next jack and repeat the test there. Going from point to point, you will soon find the point where it will not operate the trouble will then be towards the answering jack. If the signal does not operate from the line jack, the trouble might be in the signal coils. You might put a short across terminals 1 and 2 of the line signal, and find that it does not operate. If you put a short across 3 and 4 you can expect to blow a fuse. Here a test lamp or an operator's head telephone connected across 3 and 4 will test for battery, and not blow any fuses. If there is no battery at the terminals of the signal, look for an unsoldered common battery wire or ground wire.

The series multiple does not lend itself to the larger systems and the type of signal used in this particular type is too bulky. Even where lamp signals are used, the large number of contacts give too many chances for trouble due to dirt or poor contact. The bridging type of multiple system is the one that is generally used. This is illustrated in Fig. 197.

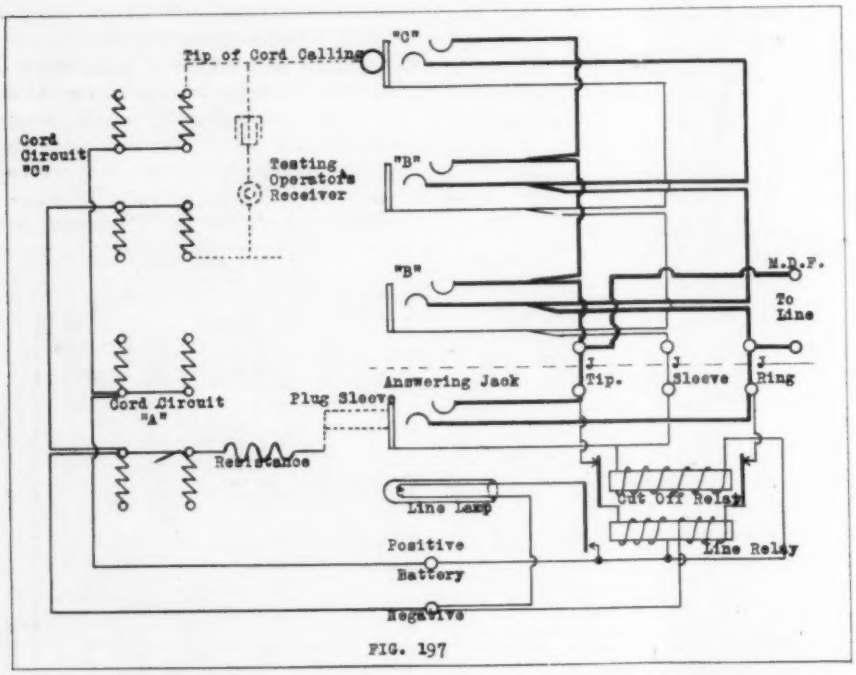


FIG. 197

The answering jacks and line lamps would be grouped as in the lower squares of Fig. 195. The line relays would be mounted either in the back of the switchboard or on a separate framework called a rack. The multiple jacks would be arranged as in the upper rectangles of Fig. 195. The cables form the multiple jacks are connected to terminal blocks on a frame called the intermediate distributing frame. The lines from the main distributing frame are connected to the same terminals as the multiple jacks. Thus the switchboard numbers on the main distributing frame, or main rack as it is commonly called, always have the same numbers as appear on the multiple jacks. The answering jacks are connected to another set of terminals on the intermediate distributing frame. On the same terminals with the answering jack cables are connected the cable from the line and cut-off relays.

The terminal blocks of the intermediate distributing frame have four sets of terminals for the answering jack side. There will be the tip, ring, sleeve and line lamp terminals. This provides a testing point for all the lines going to the answering jack and line lamps, and the line relays. The terminal for the line lamp is not shown in the drawing 197. The terminal blocks on the multiple jack side of the rack have three sets of terminals, the tip ring and sleeve. On the tip and ring terminals there would be two wires, while on the sleeve terminal there would be only the wire from the sleeve of the multiple jacks. The line jack and relays can be connected to the multiple jack by a three conductor wire called a *jumper wire*. These are indicated in the drawing by the letters "J."

Now by the use of these jumpers, we can connect any multiple jack set to any line jack and relay. Thus referring again to Fig. 195, you can see that it is possible to have, say line No. 315 in the group with the 100-line jacks of the No. 100 line group to the left, and yet the multiple jack would be in the 300 multiple groups above. The purpose of this is two fold. To distribute busy lines among the different operators, so that no one girl has to answer too many busy telephones, and second, for the use of two-party lines. These will be discussed in another place.

Referring again to drawing 197, let us follow the heavy black lines. The tip and ring wires are shown heavy, as there are the wires over which the voice frequencies must pass. Jack "C" is connected by a continuous circuit to the line terminals on the M.D.F. The tip and ring of the answering jack are connected by a continuous pair of wires to the same terminals, through the jumpers. There are no series contacts in the path of the voice currents to cause trouble.

There are two series contacts in the circuit, in the cut-off relay and the effect of an open contact here would prevent as in the series system, the subscriber calling the operator. When the subscriber removes the receiver from the hook, battery from the line relay flows out through the cut-off relay springs to the telephone. The armature of the line relay operates and closes the circuit to the line lamp. The operator inserts her plug in the answering jack.

The sleeve of the plug shown in the answering jack by the dotted lines, is connected through a resistance, and other apparatus not shown here, to negative battery. This battery flows over the sleeve of the jack to ground or positive battery through the winding of the cut-off relay. The resistance of this winding is 30 ohms. The cut-off relay pulls up both the spring contacts, and breaks the circuit from the line relay coils, to the line jack. This allows the armature of the line relay to drop back and the lamp goes out. When an operator calls a telephone, she refers to the multiple jack, since this is the only place where the line numbers hold a permanent numbering position. Inserting the plug in the multiple jack pulls up the cut-off relay, since the sleeve of the line jack and the multiple jacks are connected together.

If the sleeve wire should be open at jack "B," the cut-off relay would not pull up if a plug was put in jack "C." If the plug was inserted in jack "C" with this sleeve wire open, the line lamp would burn, because the line relay would find a circuit through the cord circuit. The location of this trouble could be quickly found by plugging into the different multiple jacks and observing the point where the line lamp was put out.

Busy Test

The busy test on this type of circuit is audible only. There is no signal to operate as in Fig. 196. We will suppose that a line is busy, by the operator having her plug in the answering jack as shown at cord "A," Fig. 197. There would be negative battery placed on the sleeve of

the answering and multiple jacks of this line. Now if another operator touches the tip of her plug to the sleeve of jack "C," she will hear a click in her receiver.

In Fig. 198 we have the same arrangement of the busy test as in Fig. 197, leaving out all the apparatus not concerned. Suppose first that the line is not busy. Then there will be ground on the sleeve of the multiple and answering jacks, through the 30 ohm cut-off relay winding. Now if the operator touches the tip of her cord to the sleeve of the jack "J," we have a balanced circuit. The tip of the operator's plug is connected to ground or positive battery through the resistance of the cord, and one winding of the repeating coil. The resistance of the repeating coil is about 27 ohms, and with the resistance of the cord will be about 30 ohms. The operator does not receive any signal as the ground of the 30 ohm cut-off relay coil will not change the potential at the tip of the plug.

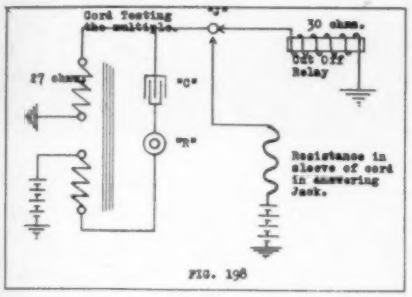


FIG. 198

Now assume that another cord is in the answering jack as in Fig. 198. Then negative battery will flow from the sleeve of the plug in the answering pack through the cut-off relay to ground. There will be a difference in potential of about 5 volts across the cut-off relay, due to the resistance of the relay, and the amount of current flowing through the resistance in the answering cord. Now if the tip of the calling plug is touched at "J" there will be this 5 volts negative battery on the sleeve of the jack. Part of this current will flow back to ground through the 27 ohm winding of the repeating coil in the calling cord circuit. This will give about 2½ volts difference of potential across the windings of the repeating coil. This will cause a disturbance charge and discharge of the condenser in the operator's circuit and she will receive a click in her receiver. The arrangement gives a low voltage charge and discharge which will not be uncomfortable to the operator when testing busy lines.

There is a small brass ring between the tip and ring of the plug of a common battery board. This ring is insulated from the rest of the plug. It provides a dead joint on the plug, to prevent a momentary short circuit being placed on the line or multiple jacks, when the plug is being inserted, or removed. Occasionally, through hard usage, this ring becomes flattened out and comes in contact with the ring connection of the plug. This allows negative battery to be placed on this ring through the lower half of the repeating coil. Now suppose when the operator is testing a line for busy, this brass ring touches the sleeve of the jack. Since this brass ring is crossed

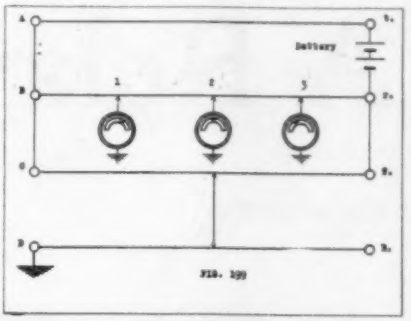


FIG. 199

with the negative battery, there will be a battery flow through the sleeve of the jack, the cut off relay winding to ground. The operator would receive a click, and would think the line was busy. This click would be much louder than the regular busy test, but in a busy traffic hour might cause several false busy tests. It is a good policy to have a regular time to check all the plugs for this condition. This is called a *routine* in Automatic Telephone Practice. Another False Busy Test could be obtained, if the Tip and Ring of the Cord are reversed. If they were reversed, then there would be negative battery on the Tip of the Plug, and this would give a busy test on any line whether busy or not. This is another case where a routine test properly attended to, will prevent poor service.

Locating Bridged Multiple Troubles

In a large Multiple System where there may be 20 or 30 multiple jacks on each line, there is always a certain amount of trouble due to defective insulation in the jacks, bits of lead pencil being shoved in by careless operators, small bits of solder, and often by the cable wires having the insulation unraveled.

Possibly the biggest job is to find just the jack where the trouble is. The trouble is usually to be found in a jack, so if we can locate the jack the actual repairing is not such a serious matter.

There are different methods of locating such a trouble, but in almost every case there is a double between one or two jacks. The writer has used the method described in the following paragraphs with considerable success.

In Fig. 199 we have an experiment which will make the method clear. Drive eight nails in a long board as shown in Fig. 199. Stretch between these some resistance wire. There will be four wires of equal length between A and t, -B and r—between C and T, and between D and R. Then connect A-B-and C together, and r and T together. Between t and r connect two dry cells.

Between wires C-T and D-R connect a short circuit. There is a ground shown at "D" but this can be a piece of flexible wire connected to the ground side of the voltmeter shown above. The voltmeter used is a Model 45 Weston which has a 2.5 volt scale. Connect the voltmeter at position "1" so that the needle will point toward the left as shown in Fig. 199. Then move it to position "3" and the needle will point to the right of the zero mark on the metere. At position "2" the needle will indicate zero or no reading. You will notice that the zero reading is obtained when the test is opposite the short circuit. Now move the short circuit to another point, and the zero point of the voltmeter will also be found opposite that point.

Now let us refer to the next drawing, Fig. 200. For simplicity we have shown the Tip and Ring of the jacks facing toward each other. The sleeve of the jacks is indicated by the circles at points 1, 2, 3, 4. There are six wires shown in this drawing. This would mean two sets of Multiple wires. The Upper set

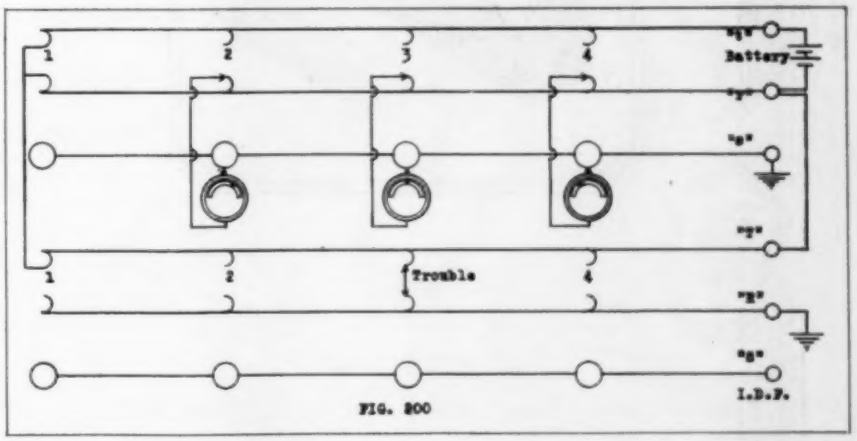


FIG. 200

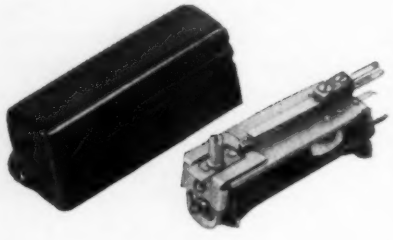
should if possible be a line in the same 100 as the line in trouble.

We will suppose that there is a short circuit at position or Jack No. 3 of the

A Relay Team T's

Line Relay

The armature is pivoted on the forward end of the heelpiece. Adjustment is made by loosening a single stud and sliding into desired position. The springs are of the proper length and thickness with permanent micrometer adjustment. The contact points are of silver alloy. Each relay is furnished with pressed steel cover that prevents cross talk. This relay is 4¼ in. long and mounts on 1⅜ in. centers horizontally and 2⅛ in. centers vert cally.



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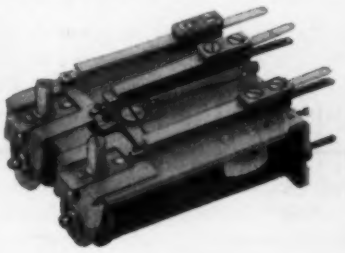
Ring-up and Cut-off Relay

This is an arrangement of two armatures with a mechanical interlock so that the ring-up relay cannot release, after being operated, until the cut-off relay operates. The operation of the cut-off relay permits the ring-up relay to return to normal. Furnished with pressed steel cover that slides on the heel-piece and is held tightly in place by a spring riveted on the heel-piece and pressing outward on the cover. Mounts on the same centers as the line relays.



lower line. The sleeve of this lower line does not enter into the test. But in testing for the short, doubtless the line has been opened at the Intermediate Distributing Frame. We will refer to this as the I. D. F.

Connect the test battery between the terminals of the I. D. F. "t" and "r." Connect "r" to "T" of the line in trouble. The Sleeve "s" will be used instead of the ground connection or the flexible wire used in the experiment in Fig. 199. We have shown "s" grounded and "R" grounded. These can be connected together at the I. D. F. instead of grounding them and the test can be made just the same. Now at the end section of the multiple connect the Tip and Ring of Test Jack No. 1 with the Tip of Jack No. 1 of the line in trouble. This can be done with ordinary switchboard plugs, or the special test plugs used for this purpose. We used to call these Oil Can Plugs. But that was a long time ago.

Now connect the voltmeter to the Ring and Sleeve of a plug with a short flexible cord. Then proceed to plug the voltmeter plug into the different Test Jacks or the upper set in Fig. 200. The meter will point to the trouble, and the closer you get to the trouble the smaller will be the reading obtained. The polarity of the voltmeter can be reversed so that the needle will point to the trouble. However, the experiment Fig. 199, should show you that the increasing reading means that you are moving away from the trouble, while a smaller reading means that you are closer to the trouble. A zero reading means that the trouble is opposite the meter.

Unless the wires of the line in trouble, and the test line are about the same length, there will be some difference in the results obtained. For the length of time required to make the test, it is best to borrow if necessary the multiple of a working line in the same 100 group, for testing.

The meter used should preferably be a milliameter, with the zero point in the center of the scale. This permits you to read the direction to your trouble without reversing the meter terminals. There are many good milliameters on the market today at a reasonable price. The type of meter used, and the average length of the multiples will determine the amount of battery to use. Better use dry cells, as the test is simplified. Using the Office Battery might cause a false test.

If the trouble was a cross between the Ring and Sleeve or the Tip and Sleeve, proceed the same, only connect the two crossed wires as shown in Fig. 200.

Fort Wayne Hallowe'en Party

Close to 400 employes, their families, and friends, attended the employes' Hallowe'en Frolic and Dance given under the auspices of the Home Telephone Athletic Association at Fort Wayne, Ind., on October 30.

The program included a prologue by the Spirit of Hallowe'en, who traced the origin of Hallowe'en from the pagan rites of the Druids to the present celebration. Other interesting features included the impersonation of three well-known officers of the company, a number of solo and duet vocal numbers by two popular radio artists, a ghost dance by a local artist, an exhibition of magic by a former professional magician, short talks by Mr. Frank E. Bohn, president and general manager and Otto Marahrens, secretary and assistant general manager, the awarding of attendance prizes, luncheon, and dancing. Music for the dance was furnished by the Home Telephone Company orchestra.

Telephone Company Is Making Improvement

Alton, Ia. (Special)—Work has been started by the West Iowa Telephone Company here on improvements to cost $10,000 which will be finished this fall. This includes the placing of all the wires underground and the moving of the office and equipment to the new home which has just been purchased. On the completion of this project the company will have spent nearly $15,000 in improvements, having completed some of the work last year.

New York Telephone Company Enlarges Appropriation

J. S. McCulloh, president of the New York Telephone Company, announced today that the board of directors, at their meeting held October 24th, authorized the additional expenditure of $2,512,800 for new construction in various parts of the territory served by the company. This brings the total appropriations made since the first of the year to $62,830,456, of which $53,803,994 was set aside for enlargement of telephone plant in the metropolitan area.

THE CIRCULATION OF TELEPHONE ENGINEER REACHES EVERY CORNER OF THE GLOBE

That Telephone Engineer is read in every country where the telephone is used is evidenced by checks received for subscriptions from foreign countries, many of them in the native language of the country. The above check is in payment of subscriptions by the government of Edmonton, Alberta, Canada. In the same mail was a check from England, for five pounds, a few shillings, etc. Telephone Engineer enjoys a large foreign as well as domestic circulation.

Independent Pioneer Hold Meeting

Pioneer Independent telephone men and women held the stage on Thursday, October 18, the third day of the national convention of the Independent telephone industry. The morning session was preceded by a business meeting of the Independent Pioneer Telephone Association which was called to order by President E. D. Shade of Johnstown, Pa. The report of Secretary J. K. Johnston of Indianapolis, Ind., was read and committees were appointed. The nominating committee recommended the election of J. J. Ihmsen, Albany, N. Y., as president for the ensuing year and named the list of vice-presidents and the executive committee. J. K. Johnston was recommended for re-election as secretary. After a motion, the election was declared to be unanimous.

The first speaker of the morning was Henry A. Barnhart of Rochester, Ind. Mr. Barnhart told some of the best stories in his own happy manner and recounted some of the happenings of early day Independent conventions. He was followed by P. C. Holdoegel of Rockwell City, Ia., who spoke of his observations during a trip abroad during the past summer. E. C. Blomeyer of Kansas City, Mo., added a touch of humor to the program through his verbal tilts with Secretary Johnston.

The final number on the morning program was an address by Judge N. C. Hunter of Wabash, Ind., a former president of the national telephone association. Judge Hunter is nearly 81 years of age and is quite deaf, but when he began to speak it was evident that he had lost none of the old oratorical fire that made him a notable figure in telephone conventions a dozen and more years ago.

Following the adjournment of the business session, the pioneers and guests, over 1,200 in all, gathered in the large banquet hall of the Hotel Sherman for the annual luncheon, entertainment and dance. The committee, made up of George W. Rodormer, chairman; J. F. Jaap, O. V. Dodge, F. L. Eldredge, A. D. Boal, C. W. Schafer and R. J. Faulhaber had arranged for a splendid meal, after which a number of vaudeville numbers were presented by way of entertainment and those who wished remained after the entertainment for dancing. The annual entertainment like those of other years was made possible by the support of a large number of telephone manufacturers and suppliers.

The Southwestern Bell Telephone Company is expending approximately $15,000 on improvements and additions to its telephone plant at Haskell, Okla.

Western Electric to Operate in Baltimore

The Western Electric Co. will build a $15,000,000 factory on a 125-acre site at Baltimore, Md. Telephone cable and wire will be manufactured there. The first buildings will be completed by the end of 1929.

Melvin G. White and Myrtle White Purchase Phone Firm

Wheeling, W. Va.—Melvin G. White and Mrs. Myrtle White have purchased the interest of Alva G. Wise of the Cameron Telephone Company and have taken over all the stock of the company. This is the oldest local company in the city. Although the Chesapeake and Potomac Telephone Company had long distance service before the organization of the Cameron Telephone Company.

When first organized it was known as the Keystone Company, but in 1902 the name was changed to Cameron Telephone Company. This company has grown steadily until they now have nearly three thousand subscribers. Long distance service is furnished free to subscribers to nearby towns as Waynesburg, Littleton, Deep Valley, Silver Hill, Glen Easton. All other long distance calls are handled through the C. & P. Company.

Mr. and Mrs. White, the new owners, will make extensive improvements to the lines.

The officers of the company are: Melvin G. White, president, and manager; Myrtle White, secretary; Earl Reese, treasurer.

NATIONAL CONVENTION

(Continued from page 21)

were covered by Mr. Schweitzer, viz.: the merit of telephone directory advertising, the vertical style of classified directory and the methods of directory distribution. Mr. Schweitzer showed that telephone directory advertising combined the qualities of circulation, persistency and repetition in a way that is done by no other medinum. In proportion to results, its cost is markably low. In discussing the vertical classified section, a method was given of converting the classified section, to this style as well as to anticipate the space requirements and increase revenue from classified advertising. Directory distribution is also an important matter and a system of distribution using a special force which completed the distribution of 31,000 directories in one day was described.

Demonstration at Plant Division Conference

Over 100 plant men and executives joined in the conference of the plant division, where a talk on "Improvement of Plant conditions was given by E. O. Neubauer, transmission engineer of the Illinois Bell Telephone Co.

The talk included a consideration of some of the troubles which may result in cases where there are insufficient separations between power and communication plants. A demonstration was also given of "Power Arc Follow-up" which was explained as being a term applied to situations where lightning flashover occurs between power and communication attachments and where once the lightning has broken down the insulation an arc is maintained by the normal power voltage.

It was explained that "Power Arc Follow-up" has been the cause of a large number of cable burns and interruptions to both telephone and power service. It was also explained that troubles from this source do not occur where proper construction and maintenance methods are followed and where adequate separations between telephone and power facilities are maintained.

The more common electrical protective devices used on power circuits and also on telephone circuits of the Bell System were described. It was brought out that the protective devices used on both power and communication plants are fundamentally the same and may be divided into two general classes:

1. Protection from abnormal voltages —provided by protector blocks in the telephone plant and by lightning arresters in the power system.

2. Protection from abnormal currents —provided by heat coils and fuses in the telephone plant and by fuses and circuit breakers in the power system.

The talk was illustrated with a number of lantern slides showing examples of unsatisfactory outside plant conditions. Slides were also presented which showed how these same conditions had been or could be improved and brought into conformity with mutually accepted standards.

The importance of co-operation between the power and telephone companies was emphasized. It was pointed out that satisfactory conditions, particularly on jointly used poles, cannot be maintained by the efforts of either the power companies or the telephone companies alone, and that to meet the problem effectively requires a joint appreciation of the situation and a desire to cooperate in dealing with it.

Traffic Problems Discussed

Central Office management, operator requirements and operator training were the subjects treated by various speakers in the conference of the traffic division. Roy F. Mapes, traffic superintendent of the Jamestown (N. Y.) Telephone Co., outlined the necessity of proper equip-

ment facilities and efficient administration of the central office. Mr. Mapes' paper was followed by a lively discussion of operating methods particularly restricted repetition and C. R. L. method of handling toll calls.

"Operator Requirements" was the subject of a paper by W. I. Howard, traffic superintendent, Tri-State Telephone and Telegraph Co., St. Paul, Minn. The time to bring an operator up to the required standard of efficiency was shown and the conditions which tend to reduce operating labor turnover were discussed. This paper was followed by a paper by Miss Bell Bernetha, of the Rochester (Ind.) Telephone Co., who gave the qualifications which operators should possess in order to be successful in their work.

Short Final Business Session

A short business session of the national association was held Thursday morning for the report of the nominating committee. Chairman P. C. Holdoegel announced that the committee recommended the re-election of the retiring directors and the recommendation was unanimously adopted. The directors re-elected are the following:

E. C. Blomeyer, Kansas City, Mo.
W. G. Brorein, Tampa, Fla.
W. H. Bryant, Mobile, Ala.
John F. Davies, Spokane, Wash.
C. C. Deering, DesMoines, Ia.
H. F. Farwell, Terre Haute, Ind.
W. L. Jacoby, Chicago, Ill.
W. R. McCanne, Rochester, N. Y.
W. J. Melchers, Owosso, Mich.
T. L. Youmans, Osawatomie, Kas.

Exhibitors at the Convention

There were more than forty exhibits at the convention, covering almost every line of the industry. Very few of the thousands of articles used in building, equipping and maintaining a telephone plant, were omitted. Following is a list of the exhibitors:

American Electric Company, Chicago; showing a full line of telephone equipment.

American Steel & Wire Company, Chicago, featuring Americore rubber covered telephone wire.

Anaconda Copper Mining Co., Chicago; exhibiting Anaconda wood preservative and weed killer.

Automatic Electric Co., Chicago; exhibiting Strowger automatic telephone systems, latest improved desk stands, in black and colors.

Bartlett Mfg. Company, Detroit, Mich.; tree trimming equipment, etc.

L. M. Berry & Co., Dayton, Ohio; telephone directory specialist.

Lynton T. Block & Co., St. Louis; compensation insurance.

Bowdle Accounting System, Cerro Gorda, Ill.; forms for accounting, service, etc.

The Buda Company, Harvey, Ill.; showing new model earth drill of trailer design.

Brown Company, Portland, Oregon; Bermico fibre conduit products.

Burroughs Adding Machine Co.; showing its electric calculator.

Carbon Products Company, Lancaster, Ohio; featuring Victor telephone batteries and Ace flashlights.

The Chance Company, Centralia, Mo.; showing Never-Creep anchors and other equipment.

Churchill Cabinet Company, Chicago; telephone booths.

Coffey System & Audit Co., Indianapolis, Ind., accounting forms, binders and holders for various forms.

The Colson Company, Elyria, Ohio; exhibiting "Telering," a new type of frequency changer.

Cook Electric Co., Chicago; central office protection.

Curtin-Howe Corp., New York, N. Y.; showing tests of wood painted with ZMA wood preserver.

Electric Storage Battery Co., New York; standard types of storage batteries for telephone service.

Everstick Anchor Co., St. Louis, Mo.; showing anchors, rubber wheel lineman's chair, etc.

French Battery Co., Madison, Wis.; telephone batteries and flashlights.

Harrah Mfg. Co., Bloomfield, Ill.; showing the Handyman guy stretcher, pole puller and pusher.

Highway Trailer Co., Edgerton, Wis.; Trailer bodies, etc.

Holtzer-Cabot Electric Co., Chicago; motor generator ringing machines.

A. J. Johnson Electric Co., Chicago; telephone supplies, wire, batteries, etc.

J. K. Johnson, Indianapolis, Ind.; samples of appraisals, maps, etc.

James R. Kearney Corp., St. Louis, Mo.; screw type anchor, and other types; cable ring saddles, guy wire clips, etc.

Kellogg Switchboard & Supply Co., Chicago; latest in switchboards and other equipment sold by that concern.

Kodel Electric & Mfg. Co., Cincinnati, Ohio; Kuprox dry metallic rectifiers.

Leich Electric Co., Genoa, Ill.; telephone equipment, and a new frequency converter.

National Carbon Co., Chicago; Columbia gray label batteries, Eveready radio receivers and Eveready Prestone, an anti-freeze compound.

North Bros. Mfg. Co., Philadelphia; "Yankee" ratchet bit brace, etc.

Page & Hill Co., Minneapolis; poles.

Philadelphia Storage Battery Co., Philadelphia; batteries.

Quick Directory Co., Indianapolis, Ind.; telephone directories.

Reliable Electric Co., Chicago; The Reliable line of terminals and protection for telephone companies.

John A. Roebling's Sons Co., Trenton, N. J.; cable, drop wire, etc.

Runzel-Lenz Electric Co., Chicago; cords, cables and wire for telephone companies.

Sands Electric Co., North Chicago, Ill.; exhibited a line of protective equipment and terminals.

Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.; telephone equipment, radio apparatus, etc.

Telephone Engineer, Chicago; represented by J. A. Smith and R. V. Achatz.

Telephony, Chicago; represented by H. D. Fargo, Sr., Stanley R. Edwards, H. D. Fargo, Jr., D. C. Sorenson, and office representatives.

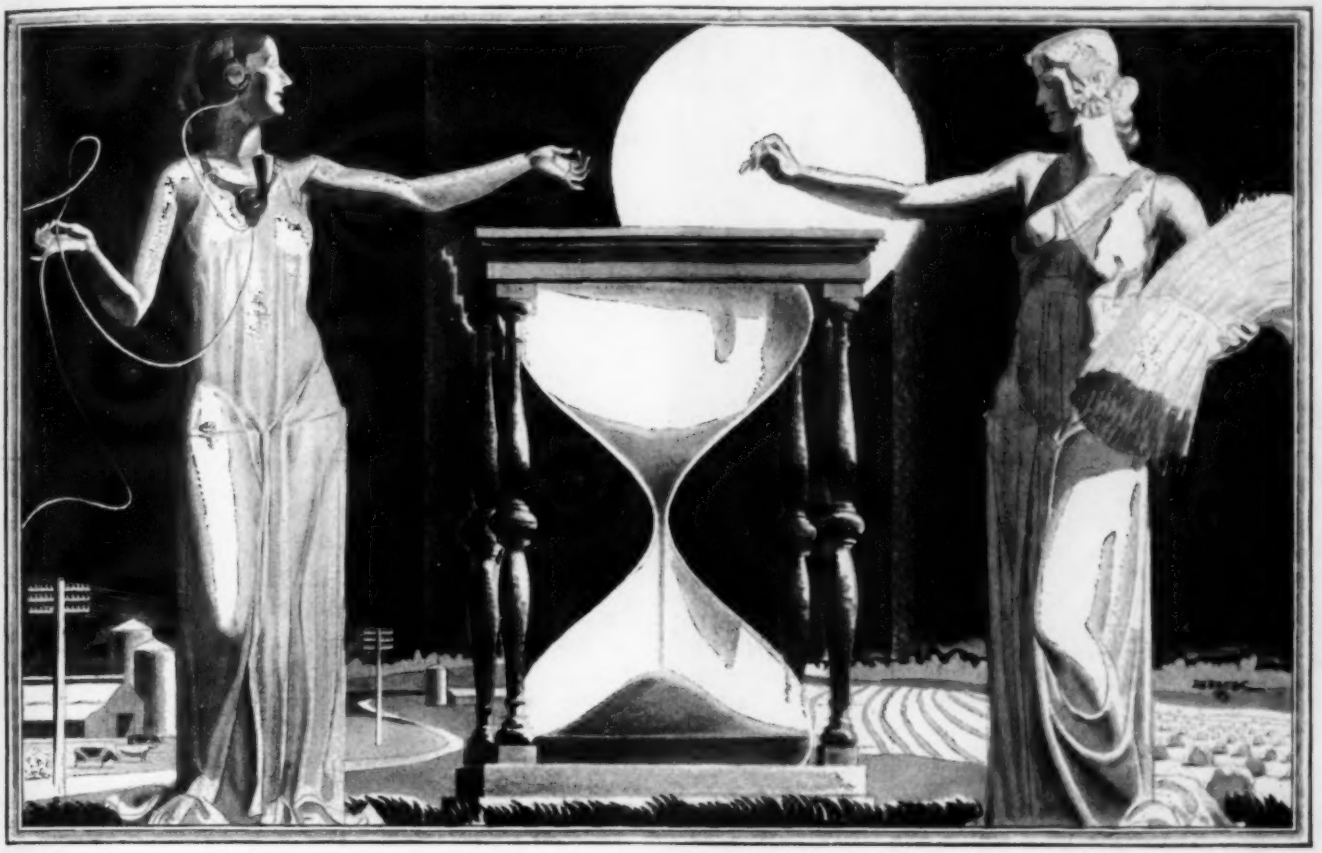
Transmitter and Electrical Journal, Fort Worth, Texas, was represented by Ray W. Smith.

Templeton, Kenly & Co., Ltd., Chicago; Simplex jacks, pole pulling cable reel and pipe pushing jacks.

Unique Mfg. Co., Chicago; Unique gasoline and kerosene furnaces for telephone, telegraph and electric light companies.

Van Praag Sales Corp., New York, N. Y.; blow torches and furnaces, soldering irons, etc.

P. Wall Mfg. Supply Co., Pittsburgh, Pa.; showing its line of Dreadnaught blow torches and furnaces.



Kansas saves Twenty Years

An Advertisement of the
American Telephone and Telegraph Company

More than three hundred studies are being carried on constantly by the research, engineering and business staffs of the American Telephone and Telegraph Company and the associated companies of the Bell System to accomplish definite improvements in telephone service.

In 1927 the number of local calls not completed on the first attempt was reduced by 5 per cent. This means the better handling of 200,000,000 calls a year.

In 1926 the average time of handling toll and long distance calls was 2 minutes. In 1927 this average was reduced to 1½ minutes, with further improvements in voice transmission.

On 6,820,000 long distance and toll calls made in Kansas in 1927 an average reduction of a minute and a half was made on each call—a total of twenty years saved.

These more than three hundred special studies have as their goal definite improvements in local, toll and long distance service. It is the policy of the Bell System to furnish the best possible service at the least cost to the user.

The American Telephone and Telegraph Company accepts its responsibility for a nation-wide telephone service as a public trust. It is fundamental in the policy of the company that all earnings after regular dividends and a surplus for financial security be used to give more and better service to the public.

Helping Telephone Help Be Helpful

By RAY BLAIN

We hear a lot of complaints nowadays around various telephone exchanges regarding the class of inefficient help that must necessarily be contended with. It must be admitted that this condition does exist in too many instances but it is not thought that the problem is understood in general or that proper effort is always made to eliminate the cause. There is one class of telephone mechanics that it is believed are far above the average mechanic in various other similar lines of work. It is not believed that there are men in any line of mechanical work that are more capable, or able to think and act on their own than this class of telephone workman. So firm am I in this belief that should it ever fall to my lot to choose a bunch of men to perform some difficult task and men especially trained in that particular line were not available I would immediately look to the telephone companies for help. This theory it seems was proved correct by the Signal Corps battalions enlisted from various telephone companies during the great war and as the records of these outfits will show.

I feel that in most cases where the telephone mechanic falls below the average that the trouble can be attributed usually to one of three causes: working conditions; wrong methods in his early training or that he is just unsuited for this class of work.

Applicants for a position with any telephone company should be chosen with extreme care. Any new employe especially a student will in all probability be a loss to the company for the first month or more until the completion of his preliminary training period. After that they should start to pay dividends so to speak. A man unsuited for telephone work even though he would work gratuitous would prove a poor investment for in addition to the detriment they can do the company in the eyes of the public they will ruin material and equipment of a value far in excess of their salary. On the other hand a well trained conscientious employe can by taking care of tools, saving of material and being careful of equipment save the company money daily. These are the type of employes that earn a good salary and pay the company dividends.

Some claim it is impossible to obtain competent help in their community. This may be true in isolated cases but in the average community there is a number of young men finishing school each year that are on the lookout for something to start into with a view of making it their life work. It seems that telephone work if presented to them in its proper light can be made as attractive as most other industries. I know of one company that demands a very high qualification of all considered. This has proved very successful as only the better class are attracted and they usually prove to be of a type that can be developed into useful and reliable men. After an applicant is accepted their training should be thorough and in detail as usually the early training either makes or breaks the man and the first impression is the one more often retained.

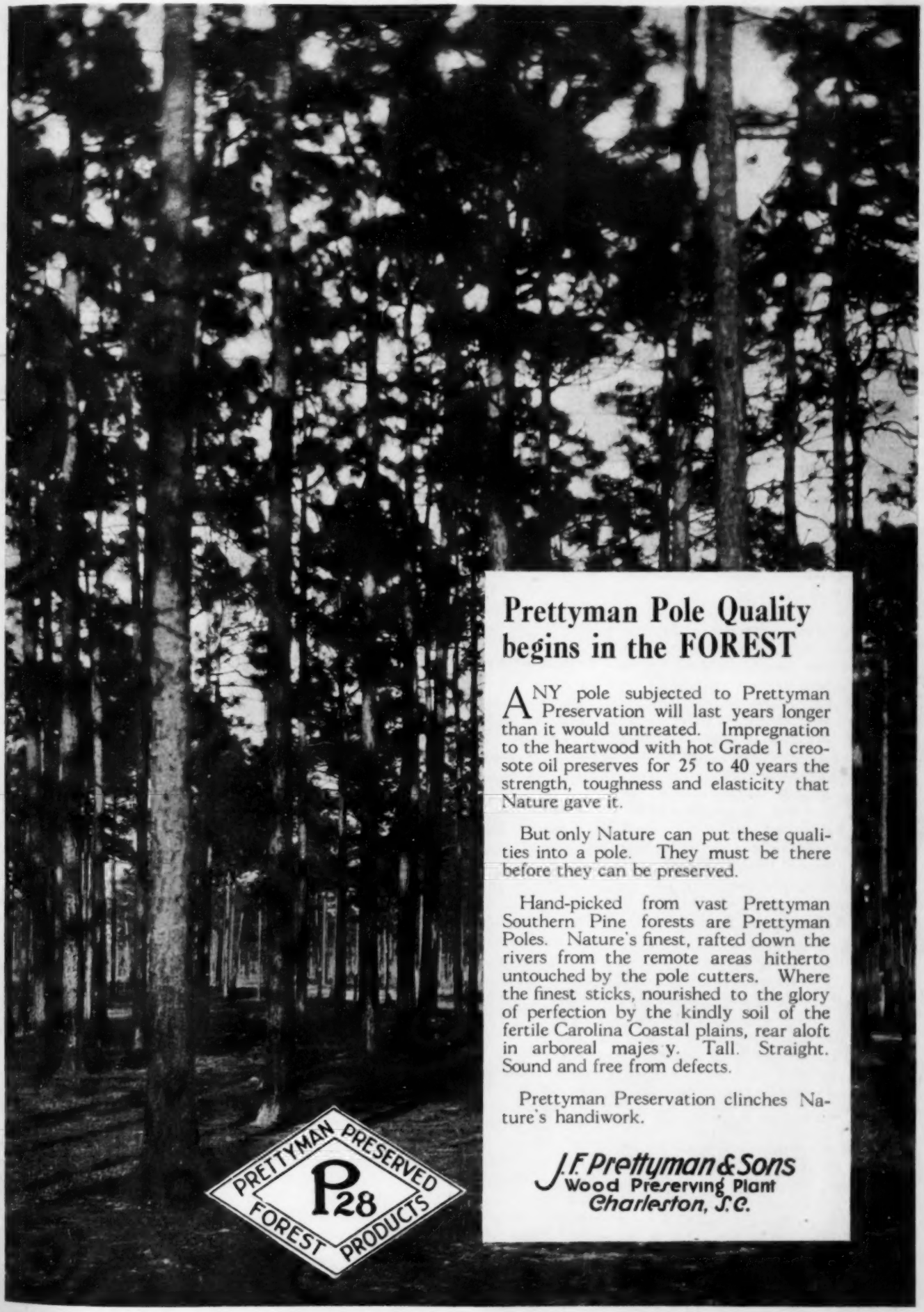
Even though the student is to be a specialist for this is the day of specialists as they can be trained quickly and are easier to replace, much can be gained by first giving him a short period of general training. Sometimes it may be good practice to start the student with a line gang to help set poles and string wire. Some usually after a few days of this hard labor will fall out but this does not matter as there is no room for lazy men that can't tolerate hard work with an their applicants before they will even be up-to-date telephone company. If the student is tried out on all classes of work he will generally indicate a preference for some certain kind and will usually be more useful than on something that has been selected for him. If a man is to be a toll tester he will make a better one if he has some experience as a toll line trouble shooter for he can then visualize the line, conditions and just what the troubleman is doing. I appreciated this fact one time in my early years when looking for trouble on the toll lead between Oklahoma City and Chickasha. I called in for a test from the junction pole at the little village of Mustang and after a scrap with the operators for the remaining serviceable circuit got the wire chief at Oklahoma City on the line. It was a bitter cold day and riding in an open buggy behind a slow livery stable team for about thirty miles was no fun even for a young man. Taylor answered on the test board and after I had told him that I hadn't found anything he asked, "Are you cold?" I readily admitted that I was and he then said, "Well put a short on three and four, find a fire and warm up for fifteen minutes and then call me again." I never met Taylor except over the wire but I have never forgotten him or his act of kindness on that cold bleak windy day down in Oklahoma. No doubt but that at some time in the past he had been a bug hunter himself and knew what a few minutes to warm up meant to a man outside hanging on a pole while his galvanometer was wiggling to a location.

But to get back to my story, some men will develop into excellent outside or construction men but are worthless on the inside. Then others make good testers or switchboard men but are no good on the outside. Some few make good combination inside and outside men but they are in the minority. The combination man it is true is a necessity in the small exchange if it is the only system owned by the one company but owing to the disadvantage of a man doing both inside and outside work I don't believe the combination practice should be adopted except when an absolute necessity. It is seldom that a man will be found to perform each class of work equally well. Usually one or both will be slighted.

I still maintain that the most important thing in telephony is good soldering and this is one of the first things that the student mechanic should be drilled in as the average telephone man's life is just one soldered joint after another and the fewer noisy or rosin ones he encounters the longer he will live and the greater will be the regard of his family for him and the better will be his rating in the exchange hereafter.

I am of the opinion that many companies make a mistaken by not having some standard practice to follow in all their work. These specifications covering the installation of telephones we will say is given to the student to study and become familiar with before attempting to install an instrument. He will then act as helper and see the specifications put into practice. After he finally starts working on his own, each job should be inspected and his mistakes if any pointed out to him. Care should be taken to point out all good points of the job first and then attention being called to the defects in such a manner as to encourage and not dishearten the student but to instill that interest and pride in his work so necessary for success in any line of endeavor.

The student should also be taught that work is not always fun. It takes character and courage to stand the "knocks";



Prettyman Pole Quality begins in the FOREST

ANY pole subjected to Prettyman Preservation will last years longer than it would untreated. Impregnation to the heartwood with hot Grade 1 creosote oil preserves for 25 to 40 years the strength, toughness and elasticity that Nature gave it.

But only Nature can put these qualities into a pole. They must be there before they can be preserved.

Hand-picked from vast Prettyman Southern Pine forests are Prettyman Poles. Nature's finest, rafted down the rivers from the remote areas hitherto untouched by the pole cutters. Where the finest sticks, nourished to the glory of perfection by the kindly soil of the fertile Carolina Coastal plains, rear aloft in arboreal majes y. Tall. Straight. Sound and free from defects.

Prettyman Preservation clinches Nature's handiwork.

PRETTYMAN PRESERVED P28 FOREST PRODUCTS

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

honesty to give fair measure—i.e., set the pole as deep in hard ground as in soft even when the boss is not looking; strength and endurance to hold on; ambition to make it easier; in fact it requires almost everything to earn our daily bread.

The student should be made to understand that no matter what schooling he has had or how well qualified he thinks he is for a certain position due to special training along some certain line, that he must have actual and practical experience. For this there is no substitute.

Perhaps the main reason so many students fail may be due to the fact that too many managers and wire chiefs in exchanges attempt to do it all themselves. They want their help trained to do as, and, what they are told, instead of training them to perform tasks that are necessary without being told. And the man who can do things he sees necessary like cutting a limb from a tree that would soon ruin a drop wire and make its replacement necessary, without being told to do it, is assuming responsibility. A man that can shoulder responsibility is always more valuable than one that must be instructed in detail. Most help can be trained to act on their own initiative which will prove of benefit to their employer if they are properly schooled into doing it.

One of the most expensive overheads in any business is detail supervision. This expense can be materially reduced by the proper training of each employe to assume his own responsibility. Then the manager can carry out the policy of the company, give general supervision, have time to be a real executive and not lose dollars while chasing after pennies.

No worth while position is easy. We must all labor and the president of the company or the engineer of the largest exchange works as hard or harder than the lowly "grunt" that digs holes over a rocky hill on a rural line.

A Motto of Service

During the past five years construction expenditures for the telephone industry have totaled $1,800,000,000. In this period service throughout the nation has been greatly improved and extended, transatlantic telephony has come into being, contact has been established between our country and other countries on this continent, and television has been made a reality.

Now, it is announced that the construction and expansion program for the coming five years will involve a still greater sum, estimated at two billion dollars or more. More districts will be opened up and brought closer to world civilization; it will be still easier for us to project our voices thousands of miles away.

Such a record is a great tribute to the executive ability, economy and efficiency of the telephone industry. Its motto—to give the best possible service at the least possible cost—has been maintained unflaggingly.

$49,000,000 Expenditure for Long Distance Telephone Construction in 1928 Approved

An additional expenditure of more than $11,000,000 for constructing long distance facilities during 1928 has been authorized by the American Telephone & Telegraph Co., according to an announcement by T. G. Miller, general manager of the long lines department, made necessary by the unusually rapid growth in the number of long distance calls. This brings the total appropriations for new construction this year on the larger haul telephone circuits of the Bell System to over $49,000,000, as compared with $36,406,000 expended in 1927. Long distance lines in all sections of the country will be improved, including three transcontinental routes. The projected New York-Atlanta telephone cable, which at the beginning of 1928 had reached Petersburg, Va., will be pushed southward to Charlotte.

Estimates at the beginning of 1928 called for 1,367 miles of new telephone cable construction. Under the new program the completion of 1,600 miles by December 31 is proposed.

Telephone Fraternity Loses True Friend

The telephone industry of Oklahoma lost one of its best friends in the death at Oklahoma City, October 25 of E. C. Patton, attorney for the Independent Telephone Companies. Mr. Patton not only possessed a deep understanding of the problems of telephone companies but took a friendly interest in his clients. At his death he possessed the complete confidence of the telephone people of the state as well as of all others who came in contact with him.

Mr. Patton was ill only one week, with double pneumonia. He was born at Fulton, Miss., January 31, 1875 where he grew to young manhood and was educated as an attorney graduating from the State and Oxford Law College of Mississippi at the age of 21. He began the practice of law at Mt. Vernon, Texas, where he married Miss Elanore Davenport, in 1898. Mr. and Mrs. Patton later moved to Fulton, Miss. where they resided two years returning to Mt. Vernon, Texas, a year later, then removing to Ada, Okla. Three years later they moved to Tishomingo, Okla., residing there about three years then transferring their residence to Guthrie where they remained until the state capitol was removed to Oklahoma City.

Mr. Patton was prominently identified with the early history of Oklahoma. He held the position of reading and recording clerk of the Oklahoma Constitutional convention. Shortly after Oklahoma became a state in 1907 he was appointed an employee of the Oklahoma Corporation Commission being advanced to secretary of the commission and later to attorney for that body which position he held until 1915 when he resigned to enter the private practice of law.

Mr. Patton enjoyed a good law practice in Oklahoma specializing however in cases affecting the interests of Independent telephone people. He identified himself with the telephone division of the Oklahoma Utilities association, and as a member of that organization as well as in his private capacity as attorney, he was able to be of great assistance in solving the problems of telephone interests.

Mr. Patton is survived by his widow, Mrs. Elanore Patton and by a son John E. and a daughter, Mary Frances, also by his aged mother who lives at Tremont, Miss. and by his brothers, Mr. C. M. Patton, of Cumby, Texas, Dr. Orlando Patton of Leeds, Texas, and Dr. Edward A. Patton of Fort Bayard, New Mexico, and his sister, Mrs. John Stone of Tremont, Miss. His funeral was held October 26, at Oklahoma City.

Italian Centers Connected by Telephone

According to advices received by the International Telephone and Telegraph Corporation, the Naples-Rome telephone cable was inaugurated in Rome, October 29th by the Under Secretary of Communications for Italy. This cable is the second section of an extensive national project for connecting the chief Italian centers by underground cable. The contemplated project covers the installation of over 3500 kilometers of cable having a total circuit length equivalent to a distance greater than that from the earth to the moon and when completed Italy will rank fourth with the countries of the world in the development of modern long distance cable systems. The execution of these comprehensive projects is being carried out by the Italian firm of Societa Italiana Reti Telefonische Interurbane, an allied company of the Standard Elettrica Italiana whose system is employed. This latter company is an associated company of the International Standard Electric Corporation which in turn is an associate of the International Telephone and Telegraph Corporation.

"Is your girl suspicious?"

"Is she! My girl is the sort that puts 2 and 2 together and gets 22."—Pelican.

"It looks like rain."

"What looks like rain?"

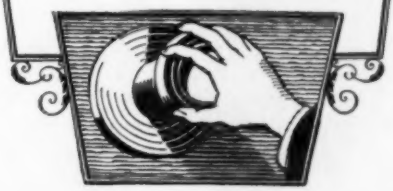
"Water."—Amherst Lord Jeff.

Here,

Gentlemen of the Committee,

is the answer of one industry

No. 3 of a series inspired by the report of Secretary of Commerce's Committee On Elimination of Waste.



A STEADY HAND AT THE CONTROLS

In manufacturing the nation's telephones Western Electric must make more than 110,000 different kinds of parts, assemble them into thousands of apparatus units, and build these units into the operating communicating system.

A manufacturing activity of such proportions would involve the danger of extensive waste were the program of production not so thoroughly co-ordinated.

Western Electric has made substantial progress in the solution of this problem by the application of an accurate schedule system to every phase of the complicated operations, from purchase of raw material, through process of manufacture, and on through distribution to customer. Moreover, where outside sources of supply of partially fabricated materials have proven inadequate or unreliable it has created as a part of itself a group of related industries.

Sure-handed control enables this Company to deliver its wide range of output when needed thus eliminating the wastes of uncontrolled production.

Western Electric

Purchasers... Manufacturers... Distributors

SINCE 1882 FOR THE BELL SYSTEM

LINE AND DESK

POWER LINE INTERFERENCE

A subscriber asks for help in the following letter:

"As a Reader of your magazine I wonder if I am entitled to ask a question? We have a country line with 10 subscribers on which has been causing me trouble for some time, due undoubtedly to a high line which runs parallel to it for about two blocks, but on the other side of the street. When this high line was built there was just a slight singing noise, but after about two months' time the line is so noisy that we can hardly use it. I have cleaned out all carbon arresters. The high line is only 6,600 volts, so did not think it could hurt much.

What I would like to know is this: Is there any other way to get this line in good service without making a metallic line out of it, which I hate to do, because the high line parallels our line only about two blocks and is about 80 feet to the east of our line.

Any information on this subject will be thankfully received."

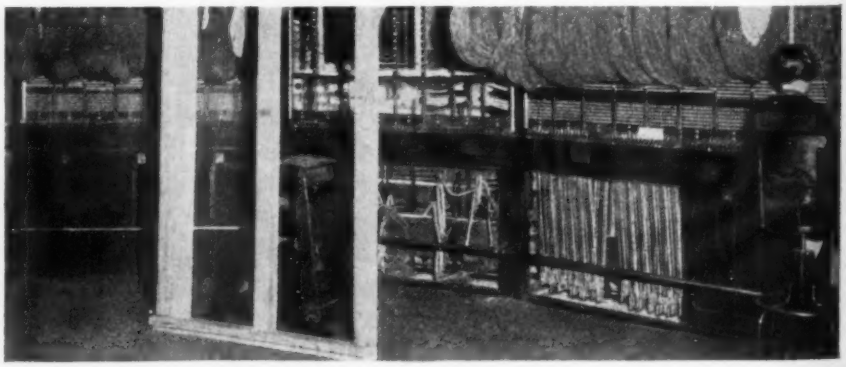
Ordinarily a parallel of two blocks on the opposite side of a street from a 6600 volt power line would not cause a large amount of noise on a grounded telephone line. That is on the assumption that the power line is balanced. The fact that there was very little noise when the power line was first built indicates this. If the line became quite noisy afterwards, it is probably due to some change in the power line. If the power line is three phase and later a single phase branch was built and attached to the wires of the three phase line this would unbalance the power line and would make the telephone line quite noisy if the single phase branch were very long. Another cause for noise would be a ground on one wire of the power line. Under certain conditions, a ground on one wire of the power line would not prevent the operation of the power line but it would unbalance it to the extent that it would create noise on the telephone circuit. It would be difficult to keep down the noise even on a metallic telephone line under these conditions. I would suggest that you get into touch with the power people and find out if their line has any single phase branches and if the wires are perfectly clear of grounds. The best way to reduce noise caused by an unbalanced power circuit is to balance up the power line. If balancing the power line still leaves your line noisy the next remedy would be to make it metallic.

DISINFECTING THE POLE YARD

In the October number we sent out a call for help for a correspondent who asked for suggestions for preventing loss of poles stored in a pole yard. Some new poles were affected by dry rot from old timber stored in the same yard. He is going to clear away the old timber, but asks if the yard can be disinfected some way to prevent further rot on new poles. Either our helpers have never met this situation or perhaps they went to the national convention and have been so busy catching up with their regular work that they forgot to send in their suggestions. The only help we received was in a conversation with the superintendent of a creosoting plant where thousands of railroad ties are stored from year to year. In substance he said: "The best way of preventing rot in timbers in storage is to keep the storage yard absolutely free from vegetation and decaying timber. Fungi will not live in earth if it is free from vegetable matter. They require air, moisture and food which is wood or vegetable matter. Covering a yard with cinders or clean coarse gravel helps to keep down vegetation. Any timber that shows decay must be removed immediately."

Incidentally the conductor of this department at the national convention noticed exhibitors who were showing new types of wood preservative composed of arsenites and arsenates of metals. One of these exhibitors also showed a "weed-killer" which was probably of somewhat the same composition. Possibly the use of a weed killer of this type would not only keep down vegetation but might have some effect in killing fungi lodged in the neighborhood of the pole pile. Who can give us some information on this?

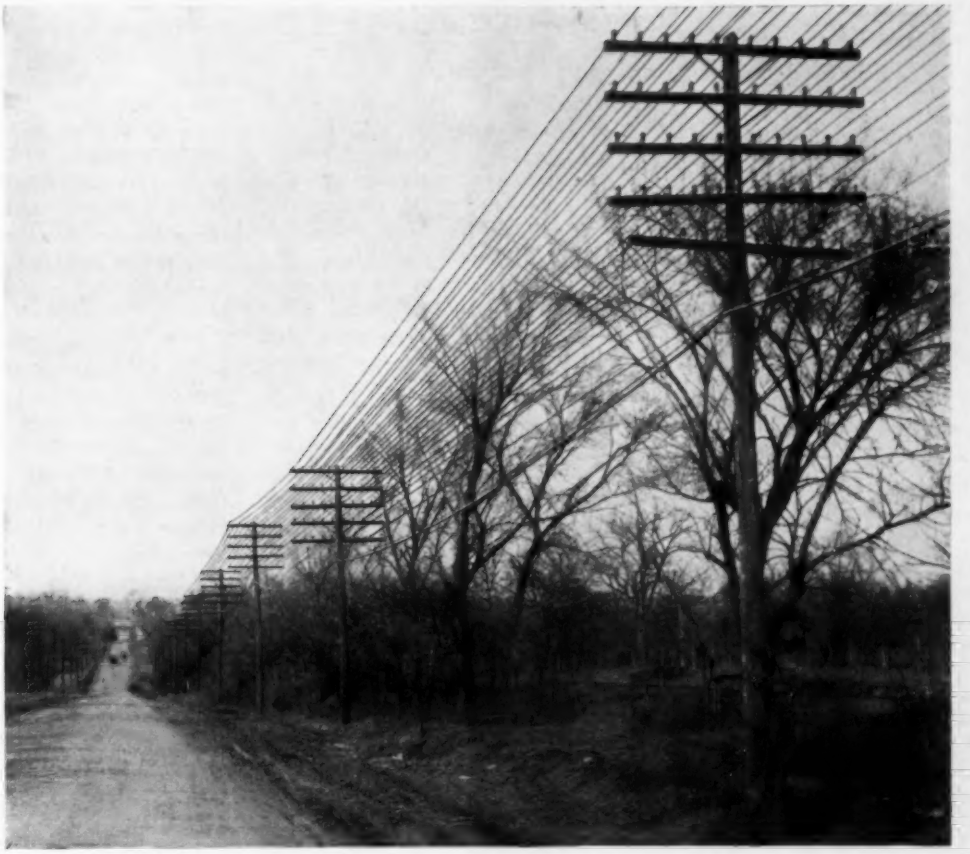
We traveled a good deal this summer. Unusual sights and humorous signs have greeted us. For instance: While driving along a highway we saw a sign: "Slow Down. Fresh Eggs." So we did, and sure enough, one of 'em came up behind, blew his horn, and yelled, "Get the h—— over, will ya!" and went tearing by. So we stepped on the gas, and soon another came up from behind on a motorcycle and yelled, "Slow down! Do you think this is a speedway?" Follow the signs? It can't be done.



RESTORING SERVICE AFTER FIRE

Early in the year, the Chesapeake and Potomac Telephone Co. suffered a loss by fire in the "A" board of its boulevard central office in Richmond, Va. The fire was extinguished by sand after the main fuse supplying the office current had been removed. Multiple cable in the fire section were immediately cut to restore service to 1,500 subscribers between this section and the head of the board. Work of connecting unused switchboard cords was started and these were used as patch cords around the damaged section. A framework to carry the cords was built and in less than 48 hours service was restored to all subscribers. The accompanying cut shown through the courtesy of "The Transmitter," shows how the patching cords were used to plug through the multiple lines to extend them beyond the damaged section.

Northern White Cedar Poles



Northern White Cedar Poles in lines of Kansas City Telephone Co. Set in 1903

Assured Service

Nature and time have not changed the development of the trees from which Northern White Cedar Poles are produced.

Those produced today are as good in every respect as those that pole users purchased a half century ago. They have the same ideal combination of advantages . . . . light weight, strength, good appearance, proper taper, and long life.

At any time during the life of Northern White Cedar Poles, you can cut gains and install new cross arms without exposing poles to decay.

Northern White Cedar Association
Minneapolis - Minnesota

Time-Tested – Why Experiment?

Ramblings

By J. A. S.

We have noted at different periods the progress of the times. Two years ago when we came to the National convention the train was equipped with a radio and we listened to a world series ball game. Last year we found telephones in the observation cars to be hooked up as soon as the train stopped at the station. This year we find a dictaphone hooked to the other end of a line and talks back to us when we call its number. Soon will come the television, etc. "And the end is not yet."

* * *

Yes, we met the boys from Texas with a yearning that must have been pathetic. A year from Texas made us feel that eternity was far on its way. Grasping the hand of John Pace from Haskell we inquired how things were in the "western hemisphere of Texas." He seemed to take it for granted that we would be here, and innocently asked: "When did you come up?" We give up. Finding after being away from that state a year that we had not been missed naturally caused us to ponder. Well, any way, what's the use.

* * *

Of course Hubenthal was here to represent the Oklahoma Utilities Association. He's a fixture in that state. And he still has the Independent telephone industry of his state wrapped around his finger. And he deserves all they give him too, for he is indeed a friend of the telephone man.

* * *

C. A. Shock, of Sherman, Texas, that very excellent builder of efficiency among employes, was on the job. His efficiency is reflected through J. C. Paxton of McAllen, Texas, formerly a protege of Shock's in the Sherman exchange. Chad Shock, elder son of the "old block," and still in his early twenties, is now manager of a string of exchanges in Oklahoma. Junior, who is hardly out of college, has shown his ability in different departments of the telephone industry. While Senior's locks are being touched with the cares by Father Time, the younger generation is preparing to "carry on." But we do not mean by this that C. A. is planning to retire. He has a score or more years of activity ahead of him yet.

* * *

And while searching the air for distant stations, we cannot help thinking of Ernest Irwin, secretary of the California Independent Telephone Association, Pomono, California. He percolates around the National convention just like a fly around the sugar barrel. And, as usual, he brings good cheer and good tidings with him when he arrives. Irwin is one of the heavy-weights from his home state, both in averdupois and ability. Yes, we always feel better after a talk with Ernest.

* * *

This reminds us that the Pioneer luncheon arranged by Rodormer-Jaap et al was another step in efficiency entertainment. Aside from making high-class equipment, these gentlemen believe in high class entertainment. We look forward to these meetings because we know it is going to be worth while.

* * *

L. M. Berry, the directory specialist of Dayton, Ohio, has a magnetism that draws friends to him and makes 'em customers in spite of themselves. His selection of directories at the convention attracted attention by its variety. Some of the directories even resembled chop suey advertisements. Verily, Berry is the berries.

* * *

Dr. H. L. Warwick of Fort Worth, Texas, was a visitor at the offices of Telephone Engineer recently. Dr. Warwick has for a score of years been working diligently to ease the pain of those fellows who have worn out their throats at political conventions, yelling for a lost cause, burning their ears up with hot stories, seeing too much at our modern vaudevilles and smelling too strongly of the corn when it is in the bottle. In other words he is a specialist in the treatment of the eye, ear, nose and throat. For more than a decade we have seen Dr. Warwick make his annual pilgrimage to foreign countries to better equip him in the performance of his duties. During all this time he has recognized the disadvantage under which professional men work in not having some way of registering telephone calls when it was impossible to answer. So he has invented apparatus which it is believed by those who have studied the matter that will be of untold value to certain lines of profession. He has promised us an article covering the workings of his apparatus as soon as a working model is completed.

* * *

Football games are great sport. Not only those who are engaged in the games get a "kick" out of it, but all lines of business are effected. Even the entertainers at the cabarets seem to kick higher after the rah, rah boys visit the haunts of the guiders of the "higher" life. Four train loads of these younger fellows traveled all the way from Texas to New York to see a game between the Army and Southern Methodist University of Dallas. And it brought the two sons of the writer to Chicago for a visit. And like all indulgent fathers we tried to interest ourself in the game. But after a few trials we realized that we are living in the past. Try as we may, we cannot keep up the pace. But the visit was worth the price, whatever that was.

* * *

Rambling around the hallways in the Hotel Sherman during the convention was Ed Naugle, formerly with the Naugle Pole & Tie Co., and "one of the chips off the old block," any way, a relation of the Naugle family, but now connected with the Bell Lumber Company of Minneapolis. Ed is located at 1320 Grove Ave., Park Ridge, Ill., when at home, but most of his time is spent on the road making the chips fly for the company he now represents. Ed played "safety first" at the convention and brought his wife along, but he was nevertheless on the job for the Bell Lumber Company every minute of the time.

* * *

J. K. Johnson of Indianapolis is still gathering telephone relics to add to the collection assembled by him the past few years. The showing is very interesting and should find lodging in some of the museums of Chicago, but like the late Champ Clark's houn' dog, they just keep kicking 'em around. It is hoped that an appropriate place will be found for them in Chicago, as this is the logical place for such a collection.

* * *

Several months ago we wrote a paragraph for this column about the connection of W. S. Pedley with the Highway Trailer Company, but for some reason it was crowded out without our consent. We want to say right here and now, though, that his connection with this firm has doubtless strengthened its prestige with the telephone industry; he is aggressive and knows the needs of the telephone man, and is therefore better equipped to serve them.

* * *

E. C. Patton of Oklahoma City, Oklahoma, attorney for Independent telephone companies in that state, died October 25th. Patton was an attorney of the old school, a Mississippian by birth and an Oklahoman by choice. Patton spent more than a score of years in that state. For many years he was connected with the Oklahoma corporation commission and after leaving that organization he represented the Independent telephone interests before the commission till the time of his death. His death will be keenly felt by the telephone industry of that state, for he was indeed a friend of the lowly telephone man. Peace to his ashes.

Force of Habit

"Why did you break your engagement with that school teacher?"

"I didn't show up one night, and she wanted me to bring a written excuse signed by my mother."

"REBUILT" TELEPHONE APPARATUS and exchange equipment saves you 30 to 50 per cent without sacrificing quality or efficiency.

SWITCHBOARDS—Telephones—Apparatus—Protection Equipment—Cable—Everything you need for the installation and operation of a complete exchange—Magneto or Central Energy—of the best and most reputable manufacturers.

Fourteen years' successful operation of our rebuilt equipment department puts it past the experimental stage. Quality and price will make you a permanent customer. Better investigate.

BARGAIN BULLETIN NO. 78 FREE

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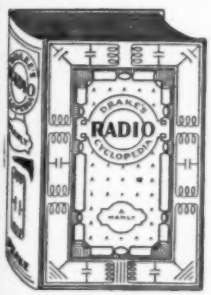
Premier Electric Company 1800-4 Grace St. Chicago, Ill.

Investigate Our Centralized Accounting Plan

This monthly Audit will save you lots of money and give you important information that you should have about your business—the best of all business, if properly managed.

BOWDLE ACCOUNTING SYSTEM

CERRO GORDO ILLINOIS



DRAKE'S RADIO CYCLOPEDIA

By HAROLD P. MANLY

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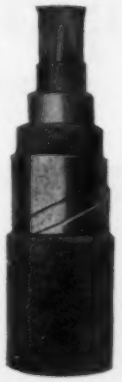

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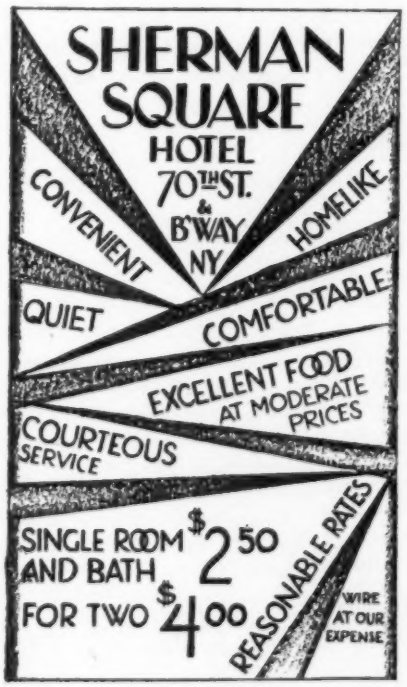

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The Philosophy of Depreciation

By FRANK F. FOWLE
Consulting Engineer, Chicago

Modern concepts of depreciation give universal recognition to the fundamental fact that retirements of property devoted to public service are ultimately inevitable from one cause or another. No one in this age of marvelous progress in technology can safely or conservatively take a contrary view, because the sum of recorded human experience demonstrates so conclusively that virtually nothing of a physical nature employed in the service of man is permanently useful.

The causes of such retirements are various. Some classes of property are slowly consumed by so-called natural causes, such as chemical or physical disintegration, regardless of their use in serving the public, and must eventually be retired for obvious reasons. Other classes are slowly consumed by wear and tear in rendering service, and must finally be retired for reasons equally obvious. But regardless of such causes, all property used in serving the public is constantly under the contingency of enforced retirement from causes which are chiefly economic in their nature, including retirements to make ways for public improvements or other facilities for public service, and retirements to make way for materially larger facilities, perhaps placed in more favorable location to render service at low cost as well as to serve much larger demand, and finally, retirements made to give the public the benefit of new and different facilities which embody important advances in the art and tend to reduce the cost of service. These causes of retirement last mentioned are often termed inadequacy and obsolescence. They are different from chemical or physical disintegration, or wear and tear, because they are intangible in the sense that they arise from causes outside the physical property itself, and they can be forecast only by studying the results of the past and applying the laws of probability to determine their expected occurrence in the future. In some cases, as perhaps in the telephone industry, there is a large mass of carefully recorded experience which lends itself to such forecasting with more or less accurate results, for the reason, partly, that the average life of the property is relatively short, or say 15 to 20 years. In the case of a modern hydro-electric plant of large capacity, on the other hand, the date of future retirement is impossible to forecast with any such accuracy as that established in the telephone industry; individual estimates of the probabilities will vary rather widely, even when the plant as a whole is segregated into its functional parts and considered piecemeal.

Frank F. Fowle

The fact of ultimate retirement for some cause or other, even though distant in the future, is pretty generally accepted as ineveitable. It is also accepted as sound doctrine that retirements of fixed capital must be absorbed by the revenues received for supplying service, in order that the integrity of the invested capital may be fully protected at all times and under all circumstances. The alternative is loss to the investor, impairment of the financial credit of the enterprise, and even ultimate failure, which are all against the best interests of the public.

Thus far we have stated doctrines which are widely if not universally accepted as sound, but when we come to consideration of the proper or approved methods of absorbing the retirements of fixed capital by charges to operating expense or income we reach a point of fundamental disagreement, which is perhaps the chief topic today of debate on the whole subject. These differences appear to involve the whole theory of public utility economics as exemplified by telephone, electric light and power, gas, and water utilities, and steam and electric railroads. Overlooking minor points of difference and considering the more fundamental issues, we may observe three different schools of thought or philosophy on this subject, which I have attempted to classify as follows:

(1) Accrued depreciation theory.
(2) Retirement theory.
(3) Maintenance theory.

By the term "accrued depreciation theory" is meant the present practice generally in force in the telephone industry under the uniform classification of accounts prescribed by the Interstate Commerce Commission for Class A companies, with which I assume my audience is so familiar that I need refer only to the general principles involved. Very briefly the practice is to forecast, as accurately as possible from the experience and expected service conditions, the average life in one location of each unit of plant of each class, and similarly to determine the expected cost of removal from service and the salvage. The original cost, plus removal, less salvage, divided by the years of expected life, gives the annual depreciation chargeable to operating expense; this can be reduced to an annual percentage of first cost, one-twelfth of which is applied monthly to all of the fixed capital of the respective class. The amount charged to expense is credited to a reserve, the immediate purpose or use of which is to absorb the retirements of fixed capital whenever they occur. The reserve is a liability account, carried as one lump figure, but fluctuating from month to month as debits and credits are made to it in the usual conduct of business. The assets represented by the reserve are initially in the form of cash, in the cash and deposits item of current assets, but ultimately find their way, under the practice of most companies, into the fixed capital. That is to say, normal condition is a reserve whose assets are invested in the property, rather than idle funds or investment securities.

This is merely the straight-line theory, stated in rather elementary terms. The wearing-value or depreciable part of the fixed capital is spread uniformly or equally by units of time throughout the theoretical life of each class of property. This theory is comparatively simple and is workable from an accounting standpoint. The size of the accumulation in the reserve will be affected by the rate of growth of the property, as illustrated by the following figures prepared by the experts of the Bell System for the information of the Interstate Commerce Commission; these figures are based on 15-year average life, 25% net salvage and mortality curve retirement:

Annual Rate of Growth	Reserve Ratio Under Stable Age Distribution
0%	32%
5	27
10	23
15	20
20	18

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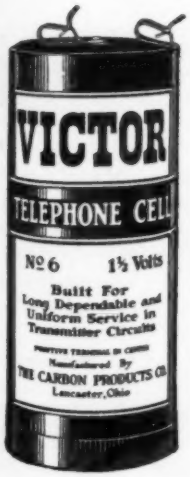

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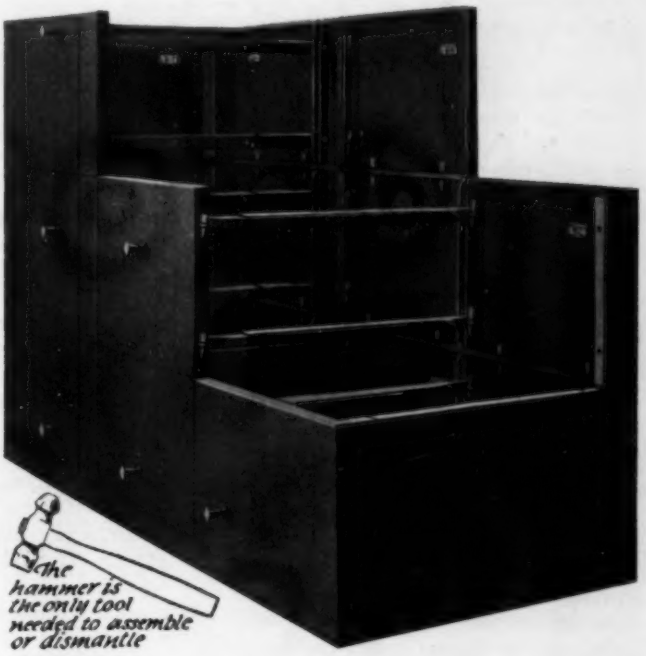

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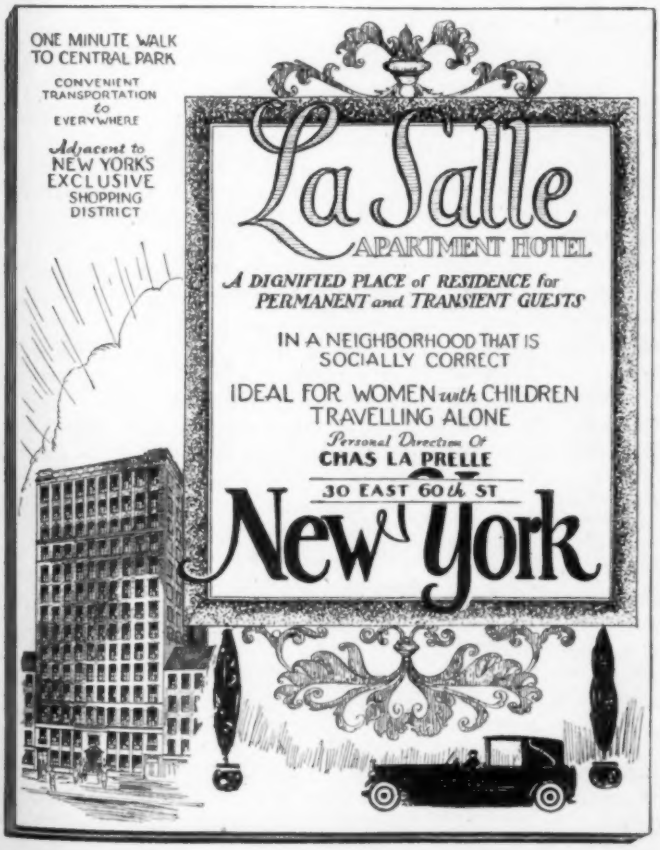
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In the foregoing illustration the annual expense of depreciation is 5%. If the annual rate of growth is 5%, the annual realized depreciation or net retirements will be approximately 3.7%, leaving 1.3% as annual net addition to the reserve; if the annual growth is 10%, the net retirements will be 2.8%, leaving 2.2% as net addition to the reserve.

In order to discuss the merits of this theory it will be helpful first to review briefly the other two theories before mentioned, and then consider them together. In 1922 the National Association of Railway and Utilities Commissioners recommended a uniform classification of accounts for electrical utilities, which has been adopted by over three-fourths of the state commissions having jurisdiction, either in full or with minor modifications. Under this system of accounts there is no item of expense for accrued depreciation, but instead there is an item known as retirement expense. The following explanation of retirement expense is taken from Rule No. 6 of "General Instructions of Operating Expense Accounts."

"An account is provided in which to include charges made in order that corporations may, through the creation of adequate reserves, equalize from year to year, as nearly as is practicable, the losses incident to important retirements of buildings, dams, etc., or of large sections of continuous structures like electric line, or of definitely identifiable units plant or equipment. 'Losses' used above means in each case the excess of the original cost to the accounting company of the property retired plus the cost of dismantling or removing over its salvage value at the time of its retirement. The cost of replacing minor parts, which is not recorded by any entries in the fixed capital accounts, and which is commonly called the cost of 'repairs' or 'maintenance' as distinguished from the cost of 'replacements' of large units, need not be provided for through a retirement reserve. The amounts charged to retirement expense plus amounts appropriated from surplus should be upon a basis determined to be equitable according to the accounting company's experience and best sources of information, and should in all cases be sufficient to provide during a period of years a reserve against which can be written off all losses sustained upon the retirement of property for any cause whatsoever."

In addition to this the text explaining account No. 782, "Retirement Expense," contains this further explanation:

"The amounts charged to this account, or appropriated from surplus, and credited to the 'Retirement Reserve' shall be in addition to the necessary costs of keeping the plant and equipment in a high state of efficiency through charges to the regular maintenance accounts."

Furthermore the explanatory text on account No. 251, "Retirement Rerve," contains the following (part of the text is omitted):

"The losses which this account is intended to cover are those incident to important retirements of buildings, of large sections of continuous structures, like electric line, or of definitely identifiable units of plant or equipment, and the purpose of the account is that the burden of such losses may be as nearly as is practicable equalized from year to year, but with due regard for amount of earnings available for this purpose in each year."

The retirement reserve created under this plan is intended to be sufficient to absorb and equalize the actual retirements when they occur, but the application of the plan is purposely left flexible and subject to the judgment of the management in order to meet varying conditions of the business, including fluctuations of revenue which are affected by cycles of business prosperity. There are great difficulties in forecasting the expected life of plant, and the average life will undoubtedly exceed the average in the telephone industry as forecast today, but this excess is at present very speculative. Under this plan the size of the reserve in ratio to the fixed capital is optional, but conceivably it can be made any figure which the management regards as necessary to protect the property as a whole, assuming that the business and the physical property have matured sufficiently to establish a condition of sound stability, and assuming that the rates for service are adequate.

In a rapidly growing business such as the electric light and power industry at present, and with a considerable proportion of fixed capital in property of long life expectancy, the ratio of annual retirements to total fixed capital will be considerably less than in the case of slower growth and shorter average life. As such a business emerges from its era of rapid growth and tends to become stabilized, there should be increasing opportunity for the application of actuarial and statistical methods to determine the life of plant in service and the establishment of the larger reserves justified by reduced rate of growth.

Emphasis may be placed also on the function of the profit and loss surplus as a source of protection in equalizing annual retirements in case unusual fluctuations occur. Moreover this system of accounting provides for four additional reserves, all of which may serve their part in protecting the property and the integrity of the investment as a whole. These four reserves provide respectively for casualty and insurance, sinking funds, contingencies, and miscellaneous requirements. It seems to me quite conceivable that the aggregate of these five reserves, in a mature and stable property, might equal at least the deduction normally expected from the appraised cost new of a well-maintained electric utility to offset accrued depreciation, or say somewhere in the vicinity of 10% of the total fixed capital.

It may be admitted quite frankly that from the accountant's standpoint this system lacks the simplicity of the straight-line methods, and is perhaps open to certain objections in respect to its lack of definiteness. However, the ultimate responsibility must always rest with the management to protect the integrity of the investment, no matter what the system of accounting for retirements or depreciation. And lastly it may be observed that the present accounting system was devised to fit the existing conditions in the electric light and power industry which is requiring exceedingly large amounts of fresh capital for annual expansion, and to which the maintenance of a high credit rating is most essential.

The third theory or philosophy of depreciation before mentioned brings us to a much older industry, of long and varied experience under a wide range of conditions, namely, the great railroad transportation systems. Here the predominant opinion holds to the theory that there is virtually no such thing as depreciation if the property is adequately maintained, where of course the retirements are all absorbed in the maintenance account. This viewpoint has been ably stated by Mr. L. F. Loree, president of the Delaware & Hudson Company, from whose testimony before the Interstate Commerce Commission in 1923, the following is quoted:

"A railroad is a composite and continuing property. It is kept in existence by perpetual reproduction, and if adequately maintained does not depreciate. Certain constitutents of railroad property wear out or perish and have to be replaced. Wear and tear and equalizing restoration go on constantly from the moment the railroad is first put in service. If it is properly maintained, renewals and replacements in time fall into rythmic routine and neutralize waste and decay. The expense of restoration or neutralization is an expense of operation not different from any other operating expense. The theory of depreciation has no application to a composite railroad property with perpetual life. Depreciation postulates that anything to which it is applicable has a limited and calculable useful life, at the end of which it must be scrapped. There is no limit to the useful life of a composite railroad property. If the theory of depreciation is carried to its logical extreme, there is nothing left for repairs; if repairs are adequately made, there is no depreciation.

(*Concluded in December issue.*)

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New Developments in Strowger Line Equipment

By L. L. RUGGLES
Sales Dept. Automatic Electric, Inc.

The history of the Strowger Automatic Telephone System over the last forty years has been a story of constant development and improvement. In general, these developments have been of two kinds; first, improvements in detailed design made possible by the better materials which have become available and by experience both in operation and in manufacture; second, changes in design which have been necessary in the adaptation of Strowger equipment to new conditions.

Outstanding among the developments of the last few years have been modifications in the apparatus used and the methods employed in connecting the line of the calling subscriber to the main switch train of the central office.

As a basis for a discussion of these new products, it might be well to glance back over a quarter of a century to the time when lineswitches were unknown. The strowger Automatic Telephone System was already a commercial product when each subscriber's line was provided with its own selector switch, capable of responding to the subscriber's calling device for the purpose of selecting a path from one telephone line to another.

It soon became evident, however, that it was neither economical nor necessary to provide each subscriber's line with a switch capable of responding to the subscriber's dial, but that it would be logical to provide only such a number of switches as might be needed to serve the largest number of subscribers who might be using their telephones at the same time.

The devices in common use for the purpose of associating a line with switch mechanisms capable of responding to the subscriber's dial may be classed as:

1. Lineswitches
2. Line finders

The lineswitch is a device which is normally connected to a subscriber's line and which, in response to the closing of the line loop through the telephone, will connect with an idle trunking switch. The line finder is normally associated with a trunking switch, and, in response to the lifting of the receiver on a subscriber's line, will seek that line and connect it with the trunking switch.

Lineswitches may be classed as (a) preselecting and (b) post selecting.

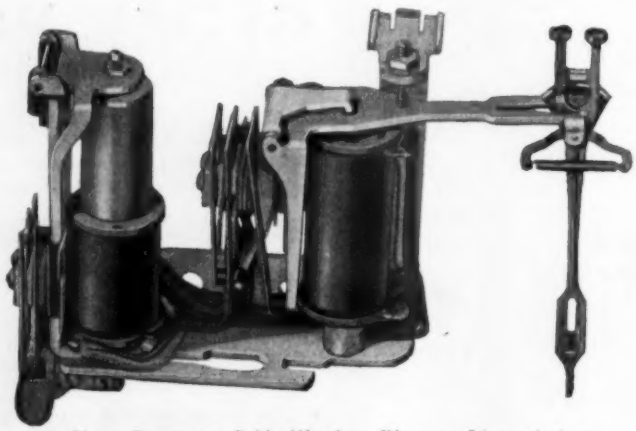
The preselecting type is that type which selects an idle trunk before a call is offered, so that a line may be connected immediately with a trunking switch as soon as the receiver is removed. The post selecting type does not begin its selection of trunks until a call is offered.

In the lineswitch group, there are two distinct types which have attained large commercial use. The plunger lineswitch, a preselector, is a Strowger development and is the only actual preselecting primary lineswitch in commercial use today. The rotary lineswitch has been used quite extensively, particularly in European countries. This is a post selector.

The line finder, which was introduced several years ago, is, however, just recently coming into wider use.

The Strowger engineering staff, in conformity with its position as pioneer in the automatic telephone manufacturing field, has constantly kept in mind the adaptation of Strowger designs to world wide requirements. With respect to line equipment, it believes it has made available the best of each of the three types. Their most recent offerings in each class of equipment are new developments, but they represent the cumulative results of years of painstaking effort and carry weight of long experience. The switches to which attention is invited are:

1. The new self-aligning plunger lineswitch
2. The new 11-point rotary lineswitch
3. The new 200-point line finder



New Strowger Self-Aligning Plunger Lineswitch

The New Self-Aligning Plunger Lineswitch:—The first commercial lineswitch was designed by the Strowger staff at Chicago and was known as the plunger lineswitch. The plunger idea of the original switch still persists, but through the years of development the switch has been improved from time to time. The latest model offers a number of marked advantages.

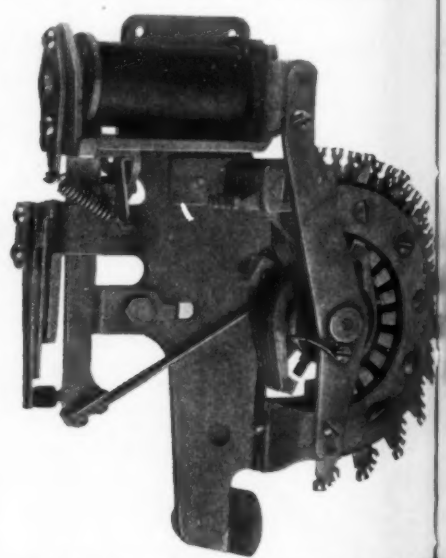
Mechanically the new lineswitch differs from its immediate predecessor in that plungers, on being released from connections, *instantly* line up with all other disengaged plungers, poised before the banks of a non-busy trunk.

This feature makes possible the taking of a new trunk on each successive call by any line. Also, should an open trunk be encountered, the plunger will instantly disengage from that trunk and engage a new one, thus eliminating any delay due to defective trunks.

The mechanical improvement in the switch applies to both the primary and the secondary lineswitches. Easy and positive centering and aligning of switch mechanism and banks is insured by the design. Other improvements may best be examined by considering primary lineswitches separately from secondaries.

Primary Self-Aligning Lineswitch:

1. This switch guards itself against seizure immediately upon operation of the



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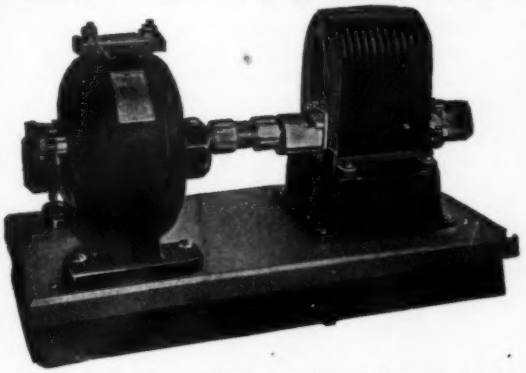

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line relay, thus leaving *no* unguarded interval.

2. Double connections are positively prevented with no apparent increase in waiting time for dial tone.

3. The perfection of this feature makes the new lineswitch the most rapid means known for connecting a subscriber's line with trunking equipment, at the same time providing absolute protection against double connections.

4. The Circuit arrangement is such that the fourth conductor in the lineswitch bank is available for special services.

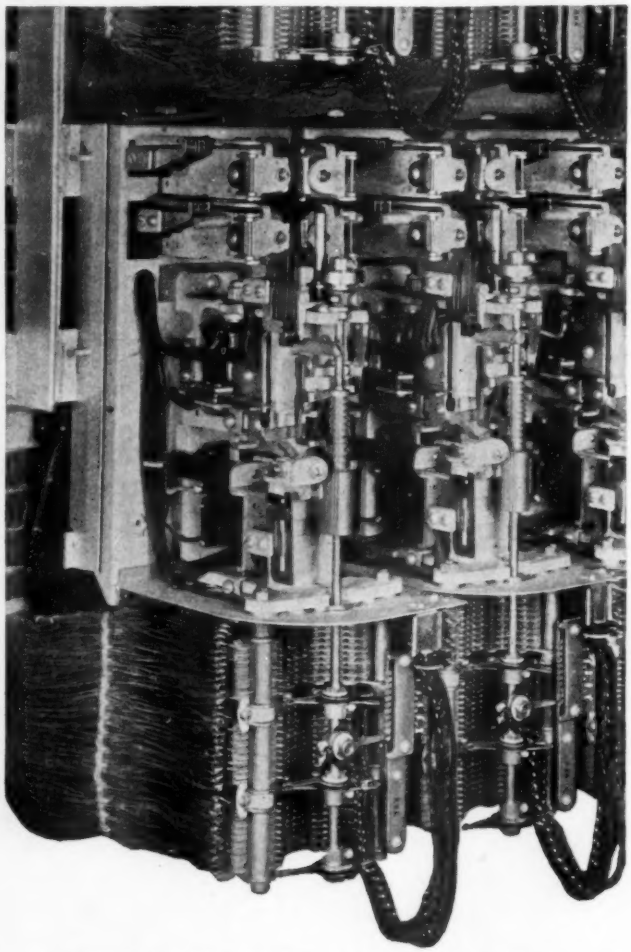
5. Reverse battery message register operation is accomplished with one relay per trunk. This meter relay may be either in the primary or in the secondary lineswitch trunk.

6. Booster battery message register operation is also fully provided for.

7. Practical means for employing partial secondaries and graded trunk multiple are offered.

Self - Aligning Secondary Lineswitch: — The new self-aligning plunger lineswitch as applied to secondary operation greatly improved operation and simplified auxiliary apparatus.

1. Double connections are eliminated.



New 200-Point Line Finders, Showing Bank Arrangement

2. Either a partial or full secondary arrangement may be installed.

3. In a partial secondary trunking scheme the individual selectors are always chosen first.

4. The secondary test panel is eliminated.

5. The new secondary arrangement eliminates any unnecessary operation of primary master switches. All that is required of the primary master switch is to step off busy trunks to secondary groups in case the secondary trunk group is busy. The self-aligning primary lineswitch enables the first selectors to be used with a 100% efficiency through secondaries.

6. The secondary master switch is now a self-contained unit very similar to the primary master switch.

7. In case a secondary lineswitch should encounter an open trunk, the primary master switch would re-select a new trunk to a secondary group.

The New Eleven-Point Rotary Lineswitch:—A type of line equipment which has been received with favor by some engineers and operating organizations has become generally known as the rotary lineswitch, because of the rotary motion given to the brush springs or wipers when searching for trunks which terminate in contact points arranged in the form of a semi-circular bank assembly.

The original rotary lineswitches manufactured by the parent Strowger manufacturer were arranged for 25-point banks giving a 25-trunk group. The 25-trunk switch circuits are all arranged to allow the switch to rest upon the last trunk position occupied until another call is offered. Then if the trunk is engaged, the lineswitch will step off to the first idle trunk. This arrangement has proven very satisfactory because of the minimum of wear on parts and because of the simplicity of the circuits involved.

There has been a need, however, for a switch of smaller bank capacity. Experience has shown that a bank having a capacity of ten trunks has wide possibilities in application. In designing this new switch, the Strowger engineers have conducted a wide survey of requirements both in this country and abroad, and the new switch bears evidence of the careful planning done before the final model was perfected.

The bank capacity is eleven trunks when used as a non-homing type switch. As mentioned above, the non-homing type has been very successfully employed and has the advantage of a simple circuit arrangement and long life with low maintenance charges.

The switch has also been planned for use as a homing switch so that a graded bank multiple may be used. The eleventh position then serves as the homing position and the bank capacity is reduced to ten trunks. When the switch is used as a homing switch, the homing circuit is carried through a cam spring and does not require an additional wiper and bank level.

The bank multiplying between switches may be done with either insulated or bare wire. The bank contact terminals are properly staggered to provide clearance between adjacent multiple wires.

The use of a secondary system of distribution with the new rotary switch will prove interesting from a technical as well as economical standpoint. Either a partial or full secondary scheme may be employed, depending upon the requirements.

The mechanical features of this new switch, listed below, are such as to insure long life, positive action and low maintenance.

A. The pawl is a single piece of flat steel.

B. The pawl drives in a straight line, there are no side stresses to cause breakage.

C. Being rigidly fastened to the armature, there are no bearings required in the pawl to armature assembly.

D. The armature is arranged to operate on a rocker principle, thus eliminating bearing pins and providing the most efficient magnetic circuit.

E. The wiper construction is such as to reduce wear to a minimum and to allow ample flexing within a small space.

F. The motor mechanism may be removed from the bank assembly by loosening two clamping screws. The bank assembly bracket provides a guide for proper alignment of wipers to banks without readjustment of the switch mechanism. This simplifies mounting.

G. The wiper and brush assembly may be dismantled to replace worn brushes without affecting the bank assembly.

H. The armature back stop has a large surface; adjustments are permanent.

Four for Two is the HAYES Rate for You!

$4.00 FOR TWO No Higher

HAYES HOTEL NORTH

420 Diversey Parkway
at Lincoln Park
CHICAGO

OPPOSITE the famous Lincoln Park where you may enjoy golf, bathing, boating, tennis, riding and many other sports--only 12 minutes to "loop"--all north bound busses pass our door.

Every room with bath

Rates
Single —$2.50 to $3.00
Double—$3.50 to $4.00
NO HIGHER

Attractive Weekly Rates

Also operating
HAYES HOTEL SOUTH
64th at University Ave.

John Hayes Frank Hayes

Write for booklet

A Controlled Flame

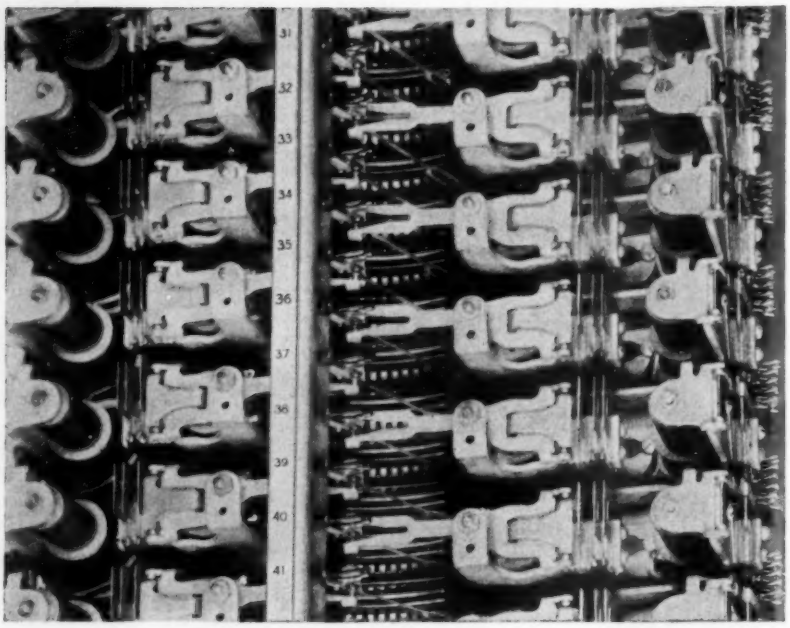
Prest-O-Lite Blow-torches, which use Prest-O-Lite Gas only, supply a flame that is always under perfect control. Heat can be applied exactly where you want it. Even the most delicate connections can be soldered without injury to the adjacent parts.

There is a Prest-O-Lite Torch for every soldering or heating purpose. Telephone companies everywhere use Prest-O-Lite equipment for lineman's work and in the shop as well. Most of the larger utilities have standardized on Prest-O-Lite.

Ask the Prest-O-Lite distributor about this equipment, or write us direct for complete information.

THE PREST-O-LITE COMPANY, INC.
Unit of Union Carbide & Carbon Corporation
UCC
New York Indianapolis Chicago San Francisco

Prest-O-Lite GAS



Group of Strowger Automatic Self-Aligning Plunger Lineswitches, Illustrating Method of Mounting

The 200-Point Strowger Line Finder: —As early as 1904 Stroger engineers developed a number of finder switches employing a two motion Strowger switch.

Until recently, however, no extensive use had been made of finders of this sort. During the past three or four years a great deal of development work has been done to improve on the earlier schemes and now there are number of telephone exchanges employing this type of finder.

The most recent accomplishment along this line is a 200-point line finder unit employing a number of unique improvements. An analysis of all the mechanical and electrical advantages of the system is not possible here, but an examination of the outstanding points will indicate the signal advancement which has been made and will show that the Strowger engineers are aggressively adhering to the policy of keeping ahead.

1. The mounting arrangement provides units of 16, 20 and 24 finders for groups of 200 subscriber lines, thus making most economical use of floor space for each trunking requirement.

2. The circuit arrangement is such as to positively prevent any double connections.

3. The finders are mounted in units to serve 200 lines. Each unit is divided into two sections. The finder switches in each section may serve any of the 200 connected lines but normally serve only 100 lines.

4. The bank arrangement is such that the finders in each section will step an average of only 8½ steps to reach any of group.

5. When the finder switches of a section are all busy, finders in the associated the one hundred lines in its preferred section will serve the entire 200 lines. Under this condition an average of 11 steps is required to find a calling line.

6. In the case of a finder searching outside its preferential section, the average number of steps it will be required to make is increased only 33 per cent over the average when searching in its own group.

7. Should a fuse blow which would put one section of finders out of service, the other section will automatically serve both subscriber line groups.

8. An improved form of allotter or distributor is used in the Strowger finder system. Two allotters are provided, one for each section of finders. If it becomes necessary to repair either of these allotters, it may be switched out by means of a key, the switching key covering the remaining allotter to serve both sections.

9. The allotter circuit is arranged to provide a different finder on each successive call.

E. J. Mendel with the Suttle Equipment Co.

TELEPHONE ENGINEER was surprised to learn and is pleased to announce that Ernest J. Mendel, formerly the auditor and publicity man for the Oklahoma-Arkansas Telephone Company of Poteau, Okla., has been called to Lawrenceville, Ill., by the Suttle Equipment Company to take the position as advertising manager for this fast-growing concern who are jobbers, manufacturers, rebuilders and printers to the Independent telephone industry.

Mr. Mendel's training and past experience equips him especially well for his new work. Mr. Mendel's education and practical experience from the time he left school until he entered the telephone industry in 1925 was along the lines of advertising and sales promotion. Since 1925 Mr. Mendel has become identified with the telephone industry in such a way as to give him the working knowledge of the business as well as an insight into the problems of the Independent telephone managers. All of this experience combined places Mr. Mendel in a unique position of efficiently serving the many hundred customers of the Suttle Equipment Company with whom he is now connected.

During the past three and one-half years Mr. Mendel has made a great many friends in the Independent telephone industry because of the part taken by him in the toll division case of the Oklahoma-Arkansas Telephone Company versus Southwestern Bell Telephone Company, which has recently been appealed by the Poteau company to the supreme court of Oklahoma.

It is with pleasure that the TELEPHONE ENGINEER take this opportunity to acquaint Mr. Mendel's many friends in the telephone industry that he has become connected with the Suttle Equipment Company of Lawrenceville, Ill.

E. J. Mendel

Millions of Everstick Anchors

EXPANDED

are in satisfactory service. Do you not think this convincing?

Order Eversticks through your jobber.

THE EVERSTICK ANCHOR CO.
Saint Louis, Missouri

As soon as the receiver goes back on the hook—

Greater "come-back" power is the reason for the outstanding success of French Ray-O-Vac cells in telephone service. As soon as the receiver goes back on the hook, these active cells start rebuilding their strength and power reserve.

Exhaustive scientific tests have proved the stronger recuperative powers and longer high voltage of Ray-O-Vac telephone cells. And these tests are substantiated by Ray-O-Vac's long record of satisfactory service in the field.

Why not let these longer-lived cells improve your transmission and cut replacement costs? Just specify French Ray-O-Vacs the next time you buy batteries.

FRENCH RAY-O-VAC TELEPHONE CELL

FRENCH BATTERY COMPANY

Sales Office:
30 N. Michigan Avenue, Chicago
Factory: Madison, Wisconsin

Branches: New York, Chicago, Atlanta, Los Angeles, Minneapolis, Kansas City

Also makers of Ray-O-Vac Radio Batteries, Ray-O-Vac Ignition Batteries and Ray-O-Vac Flashlights and Batteries

Prize-Winning Float at Fort Wayne Parade

Viewed by thousands along the line of march, the float entered by the Home Telephone & Telegraph Company of Fort Wayne in the trades' parade which climaxed "Hospitality Days," was pronounced one of the most beautiful and elaborate of the fifty-two floats participating in the parade.

The makeup of the float with the huge dial in the center surrounded by little boys representing the various lines of endeavor served by the company, and with a bevy of pretty girls in costume representing the different nationalities served, all connected to the dial with silver streamers, aroused enthusiastic applause from the crowds along the line of march.

Telephone Progress Continuous

The average time necessary for handling long distance telephone calls was reduced 25 per cent in 1927—from two minutes to one and one-half minutes. About 90 per cent of all calls are now handled without the subscriber leaving the telephone, as compared with 80 per cent during 1926.

An improvement in local service has been achieved by reduction of 5 per cent in the number of calls that failed of completion on the first attempt.

The average time taken for installing telephone service was further reduced during 1927 by about half a day.

While the United States has the best telephone service in the world in efficiency of service and facilities, the industry has never been content to rest on its laurels, but has a record of unwavering progress. Each year marks a new high point of telephone communication.

But you couldn't make some of the folks who use the 'phone believe it.

New Bulletin by The Wagner Electric Co.

The Wagner Electric Corporation of St. Louis has just issued a new bulletin describing Wagner large RA single-phase repulsion-induction motors. The bulletin is full of illustrations and detailed description of every part of the motor. Not only is the motor picked to pieces to make clear to motor users what each part of the motor is for, and why it is made that way, but it is also a text book on single-phase motors in general, covering such subjects as type of single-phase motors, history of repulsion-induction motors (from the first hand-cranked motor to the present self-starting, self-ventilated type), operating principles (both electrical and mechanical, with torque-speed-current curves and cross sectional diagrams of the motor), sleeve and ball bearing construction (illustrated with cross section diagrams and photos), ventilation, and construction features of stator, end plate, rotor and rocker arm.

This bulletin fills a long-felt need for detailed information on single-phase motors, and was written to give motor users that information.

Anyone interested in receiving a copy of this bulletin should address Wagner Electric Corporation, St. Louis, Missouri, and ask for Bulletin 157.

Alimentally Speaking

"They say if there's anything in a man, travel will bring it out."

"You tell 'em! I found that out my first day at sea."

Improve Your Service.
Reduce Your Ringing Cost.

Size: 12″ x 9″ x 5″

ONE REED!
ONE CONTACT!

TELERING

Direct Conversion of 60 Cycle Lighting Current to 20 Cycle Ringing Current
FOR ALL TELEPHONE RINGING PURPOSES

SIMPLE
LOW FIRST COST
SELF-STARTING
SELF-CONTAINED
IDEAL WAVE FORM
NEGLIGIBLE UPKEEP
WILL NOT PUNCTURE CABLE INSULATION.
WILL NOT BREAK DOWN KEY INSULATION.
KEEPS RINGING LEADS OUT OF CABLES.
ELIMINATES C. O. DISTRIBUTING EQUIPMENT FOR P. B. X. RINGING.
SHORT-CIRCUITING IS HARMLESS.

INSTALL THE TELERING AND SAVE ITS PRICE

DO YOUR P. B. X. RINGING WITH THE TELERING AND SAVE THE CABLE PAIRS FOR REVENUE.

Price $40.00 Complete
F. O. B. Elyria
Order from your supply house or direct.

Manufactured by
THE COLSON COMPANY
Elyria, Ohio
Established 1885

Globe-Wernicke Manufacturing Steel Partition

The outstanding features of the line of Steel Partition being made by the Globe-Wernicke Company are their Steelpact panels. These consist of a central core of Celotex to which is secured stretcher-leveled steel sheets.

A smooth, unbroken flow of lines, and new and exclusive burnished finish are also characteristic.

Using Steelpact panels from floor to ceiling, a space-conserving wall of high insulating value is obtained. The panels are mitred and welded, producing a paneling effect that makes the partition suitable for use in corridors as well as inner office subdivision.

Structural type posts and a continuous base mould that hugs the floor line and eliminates crevices and corners, solve two of the most important problems of hollow metal construction.

Partitions are fitted to any space by combinations of posts and panels with double steel top and end fillers adjoining side walls and cornices.

Complete architectural data is contained in Bulletin D, published by the company.

With Gustav Hirsch & Co.

James L. Riddell, for 20 years superintendent of Construction of the Keystone Telephone Co. of Philadelphia, Pa., has associated himself with the Gustav Hirsch organization of Columbus, Ohio. Mr. Riddell was one of the earliest employes of the Keystone Telephone Co. and has had a vast experience in Construction Maintenance and Engineering problems.

RECONSTRUCTED EQUIPMENT

Stromberg-Carlson No. 599 4-bar 1000 or 1600 ohm Bdg. compact type wall telephones, with Western Elec. Transmitters @ ..... $ 6.90
Stromberg-Carlson No. 992 type 4-bar 1000 or 1600 ohm Bdg. desk sets @ 10.50
Kellogg No. 2696 type 4-bar 1000 or 1600 ohm Bdg. compacts $7.75—4-bar @ 8.50
Kellogg No. 28 desk sets with new Cabinet inside connection rebuilt signal set, 3-bar 1000 ohm $10.00—4-bar @ 10.75
Western Elec. No. 20 desk set with W. E. Trans. & Rec. complete with 3-bar 1000 or 1600 ohm exposed post signal sets @ 9.50
Western Elec. No. 20 desk set with W. E. Trans. & Rec. with new Cabinet inside connection Rebuilt Signal set, 3-bar 1000 or 1600 ohm @ $10.50—4-bar @ 11.00
Dean C. B. Steel hotel sets (Balance coil type) equipped with straight line or Harmonic ringers @ 3.75
Kellogg No. 17 Repeating coils @ 2.75
American Elec. No. 36 type 4-bar 1000 or 1600 ohm Bdg. compacts equipped with Kellogg or Western Elec. Transmitters @ 6.25
American Elec. No. 360 Pony type 3-bar 1000 or 1600 ohm Bdg. compacts with Western Elec. or Kellogg Transmitters @ $6.75—4-bar @ 7.25
Monarch 3-bar 1000 or 1600 ohm Bdg. compacts @ $6.75—4-bar @ 7.25
No. 19 single Conductor inside Rubber covered telephone wire, per 1000 feet @ 3.25

Write for Our Bulletin

REBUILT ELECTRIC EQUIPMENT CO. Not Inc.
1940 W. 21st St., Chicago

Telephonic communication between Madrid, the capital of Spain, and Lisbon, the capital of Portugal, was opened recently.

Approximately 20,400,000 telephones out of the world's total of 29,400,000 on January 1, 1927, were operated by private concerns.

Telephone Engineer and manager, 25 years' experience, capable and energetic. At present employed but desires to make change. Can furnish references from past and present employers. Prefer company of 10,000 or more stations in need of rehabiliation. Address TELEPHONE ENGINEER, 192 N. Clark St., Chicago.

WANTED—Good combination inspector and troubleman who has had experience on cable trouble. Permanent position for good all around man. Address "Troubleman," care TELEPHONE ENGINEER, 192 N. Clark St., Chicago.

FOR SALE

Stromberg Carlson 2 conductor S-22F cords with No. 56 G plugs @ 50c.
Stromberg Carlson 4 bar 1600 short type wall telephones, $8.50.
Leich 7A ringing machines, operates from 110 volt A. C. current, $40.00.

TELEPHONE REPAIR SHOP
6966 Ravenswood Avenue
Chicago, Illinois

UNIQUE FURNACE

GASOLINE—KEROSENE

PATENTED ARRANGEMENT FOR DISLODGING COIL WITHOUT TEARING DOWN FURNACE
PATENTED SEAMLESS TUBING COIL GENERATOR
IMPROVED ONE PIECE BURNER
HAND HOLD FOR CLEANER ONE TURN CLEANS ORIFICE
AUTOMATIC ORIFICE CLEANER
AUTOMATIC PUMP INSIDE TANK
16 GUAGE STEEL TANK WELDED BOTTOM

10 MINUTES TO MELT 50 lbs. OF SOLDER

But—more important—

The experienced cable splicer will be surprised at the length of time it will remain in the field without attention!

Literature?

UNIQUE MANUFACTURING CO., Inc.
221 Whiting St. Chicago, Ill.

PEARL LIFE-TIME DROP WIRE BRACKETS
Save time, labor and waste
Hot-galvanized screw-hooks and malleable castings are separable and indestructible. Standard 2 groove porcelain. Stocked by telephone manufacturers.
WM. H. PEARL CO., Indianapolis

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
711 Poplar St., Terre Haute, Ind.

Get your
Telephone Repair Work
done at the old reliable
Telephone Repair Shop
SUTTLE EQUIPMENT CO.
LAWRENCEVILLE, ILL.

TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

WALTER CRAIGHEAD
Manager

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

SCRAP PLATINUM

Highest prices paid for discarded or obsolete telephone and switchboard apparatus; platinum contact relays, ring keys, etc. Have specialized in this field for many years.

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Write for Particulars
J. H. WELKER
McKinley Block, Canton, O.
Telephone 8009
DIRECTORY ADVERTISING EXCLUSIVELY

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys Financial Investigations, Organization and Operation of Telephone Companies
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
Rm. 2130 Bankers Bldg., Chicago

J.K. Johnston, Telephone Engineer
During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals 663. Would you like to avail yourself of my services?
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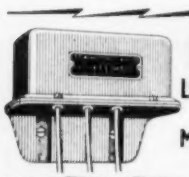
CONSULTING ENGINEER
613 Merchants Bank Bldg. Indianapolis, Ind
Special attention given to all matters pertaining to Valuations and Investigation of Public Utility Properties.
Formerly Chief Engineer, Public Service Commission of Indiana

ACCOUNTING
Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
HERDRICH AND BOGGS
Certified Public Accountants
1014 Merchants Bank Bldg., Indianapolis, Ind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LIGHTNING ARRESTERS
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MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

Phone Adams 5646
Snook, Martin & Co.
Consulting Engineers
40 WEST GAY STREET
COLUMBUS, O.
Make Use of Our Combined Century of Engineering Experience

Eastern Sales Office Moved and Enlarged

The New York sales office and display room of The C. F. Pease Company, Chicago, formerly located in the Grand Central Terminal, New York City, has been moved to new quarters occupying the entire 7th floor, Ashforth building, at 12 East 44th street, New York City. Because of the increased floor space in this new location, this office, under the direction of T. K. Murphy, eastern sales manager, has improved facilities for stock and display of a complete line of "Everything for Blue-Printing" and drafting room furniture. Also an increase in sales personnel has made it possible to more efficiently serve the entire eastern coast trade in connection with requirements for blue-printing machinery, blueprint paper and drafting room furniture.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912,

of Telephone Engineer, published monthly at Chicago, Ill., for October, 1928.

State of Illinois, County of Cook, ss.—Before me, a notary public in and for the state and county aforesaid, personally appeared J. A. Smith, who, having been duly sworn according to law, deposes and says that he is the owner of the Telephone Engineer and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—J. A. Smith, Chicago, Ill.

Editor—R. V. Achatz, Aurora, Ind.:

Managing Editor—J. A. Smith, Chicago, Ill.

Business Manager—J. A. Smith, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) —J. A. Smith, 192 N. Clark St., Chicago, Ill.

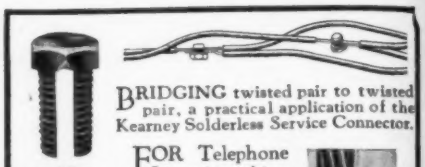
3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.) —W. H. Graffis & Sons, Chicago, Ill.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him. J. A. SMITH, Owner.

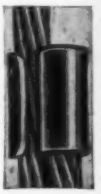
Sworn to and subscribed before me this 1st day of October, 1928.

(Seal) Carl A. Johnson, Notary Public.

(My commission expires Feb. 21, 1932.)


BRIDGING twisted pair to twisted pair, a practical application of the Kearney Solderless Service Connector.

FOR Telephone Lines in making party line taps, order Catalog No. 86. The tap can't slacken off. This connector is for No. 12 wire or smaller.


Kearney Guy Wire Serving Clips. Eliminate Serving End of Strand. Made of Aluminum, Copper, and Galvanized Iron.

Unassembled Connector

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JAMES P. KEARNEY CORPORATION ST. LOUIS, MO.
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New Guaranteed
¼ h. p., A. C., 110v., 60-cycle, 1-phase, double shaft
MOTORS
complete with emery and buffing wheels
$15.00
F. O. B. Chicago
150 slightly used cablemen's 2 wheel tool carts, formerly used by the Illinois Bell Telephone Co. $7.50 each
Used Drop Wire
$25.00 Per Ton
W. M. Miller & Sons
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OPERATORS' BREAST PLATE SETS

S. C. white enameled breast plate operator's sets complete	$5.00
S. C. No. 23 plugs for same	.35
New mouthpieces for same	.50
S. C. No. 20 operators' receivers and head band	2.00
Kellogg S. and S. Co. No. 1076 operators' breast plate sets complete	5.00
S. C. and Kellogg jacks for above sets	.35

BUCKEYE TELEPHONE and SUPPLY CO.
COLUMBUS, OHIO